34th Year

MARCH, 1951

RUBBER AGE

INCREASED GR-S SUPPLY

SUGGESTS

REOGEN-BONDOGEN

Use Both of Them

FOR EASY PROCESSING

RODFORM CUMATE

FOR SPEEDING CURE

R. T. VANDERBILT CO. INC.

230 Park Avenue, New York 17, N. Y.

Plant tested...

If you're producing reclaim, it will pay you to investigate RR-10, Du Pont's new reclaiming agent. After extensive experimentation and plant trials, many companies have found it to be the most effective agent ever tried for reclaiming rubber, GR-S, and mixtures of these elastomers. They report that RR-10 produces smooth reclaims with good tack . . . that it does the work quickly and economically. One user states, "RR-10 is the most powerful reclaiming agent we have ever tried."

The use of RR-10 results in higher-quality reclaim because less reclaiming oils are necessary. It can be used in either the pan or neutral (zinc chloride) process. And unlike most other chemical reclaiming agents, it is also effective in the alkali process.

Samples of Du Pont RR-10 are available. For complete information, contact our nearest branch office. E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division, Wilmington 98, Delaware.

BRANCH OFFICES:

Akron, Ohio	40 E. Buchtel Ave.	HEmlock 3161
Boston, Mass.	140 Federal St.	HAncock 1711
Chicago, Ill.	7 S. Dearborn St.	ANdover 3-7000
Los Angeles, Cal.	845 E. 60th St.	ADams 3-5206
New York, N. Y.	40 Worth St.	COrtlandt 7-3966

DU PONT RUBBER CHEMICALS

E. I. du Pont de Nemours & C (Inc.), Wilmington 98, Del.

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

THE RUBBER AGE, published monthly by The Palmerton Publishing Co., Inc., Printing Office, East Stroudsburg, Pa. Editorial and Advertising Offices at 250 West 57th Street, New York 19, N. Y. Entered as second class matter October 20, 1933, at the Post Office at East Stroudsburg, Pa., under the Act of March 3, 1879. Subscription in United States, $3.00 a year; Canada, $3.50; Foreign, $4.00. March, 1951. Vol. 68, No. 6.

Another new development using

B. F. Goodrich Chemical Company ***raw materials***

NEW IDEA IN OIL FILTERS

–a re-usable *Hycar* **GASKET!**

Oil filter by PurOlator Products, Inc., Rahway, N. J.

B. F. Goodrich Chemical Co. does not manufacture this gasket. We supply raw materials only.

IDEA-MEN are always finding some new sales-making use for Hycar—like the gasket for a new type oil filter pictured here. Because of Hycar's many advantages over materials formerly used, this gasket can be used over and over—whenever the filter is replaced. Permanency of seal and retention of oil are *assured!*

For use in parts that must withstand oil, gasoline and other deteriorating fluids, Hycar can be compounded to provide low absorption. Yet, it remains practically unchanged in hardness, elongation and tensile strength even after prolonged exposure.

Excellent resistance to cold flow and compression set are characteristic of Hycar compounds. They exhibit good flex-life and have extreme resistance to oxidation and aging.

What Hycar does for this gasket may give you an idea for improving or developing a product. Any one, or combination of Hycar's advantages—resistance to oil, gas, heat and cold, weather and wear—may be just what you need. We make no finished products—supply raw materials only. But our staff is always ready to help you with technical service. Just write Dept. HA-2, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, O. Cable address: Goodchemco.

B. F. Goodrich Chemical Company

A Division of The B. F. Goodrich Company

Need extreme temperature resistance? Hycar has it—plus abrasion resistance and more advantages

Hycar

American Rubber

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers

Philblack* A *with* Philblack* O

Keeps mileage high but tire costs low!

If you're wondering which end is up these days, let both Philblack A and Philblack O come to your rescue. Mixed together, these two blacks team up to make possible the production of quality tires at moderate cost.

Premium Philblack O and lower cost Philblack A, blended in a two to one ratio, will produce tire treads with wear and flex resistant properties equal or superior to channel black stocks and at lower cost.

In brief, mixtures of Philblack O and Philblack A provide you with desirable processing properties and long service life for your product at an attractive price.

Dense, firm Philblack O and Philblack A pellets handle efficiently in hopper cars and most bulk conveyor systems. Bagged Philblacks also available.

PHILLIPS CHEMICAL COMPANY

PHILBLACK SALES DIVISION

EVANS BUILDING · AKRON 8, OHIO

Philblack A and Philblack O are manufactured at Borger, Texas.

Warehouses in Akron, Boston, Chicago and Trenton. West Coast agent: Harwick Standard Chemical Company, Los Angeles. Canadian agent: H. L. Blachford, Ltd., Montreal and Toronto.

Phillips 66

*A Trademark

Save 10%

in resin and resin costs by

reinforcing with Pliolite S-6B

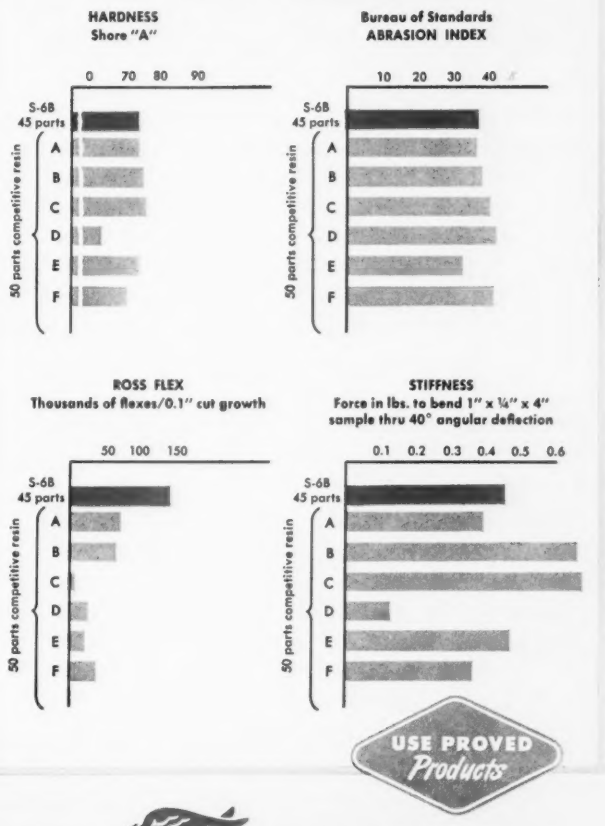
FOR all practical purposes, you can equal the results you get with comparable resins—*using 10% less* PLIOLITE S-6B. The charts here show you actual test comparisons between Goodyear's use-proved reinforcing resin and competitive materials used in shoe sole stocks. But there's one important difference — 10% less PLIOLITE was used to achieve the results shown.

You should make other savings, too, because PLIOLITE S-6B is readily processable, with superior dispersion characteristics, improved flow and minimum shrinkage.

If you're not already using PLIOLITE S-6B in a 45-parts-per-100-parts-of-rubber formulation in shoe sole stocks, it will pay you to evaluate this resin now. Write today for details and sample to:

Goodyear Chemical Division
Akron 16, Ohio

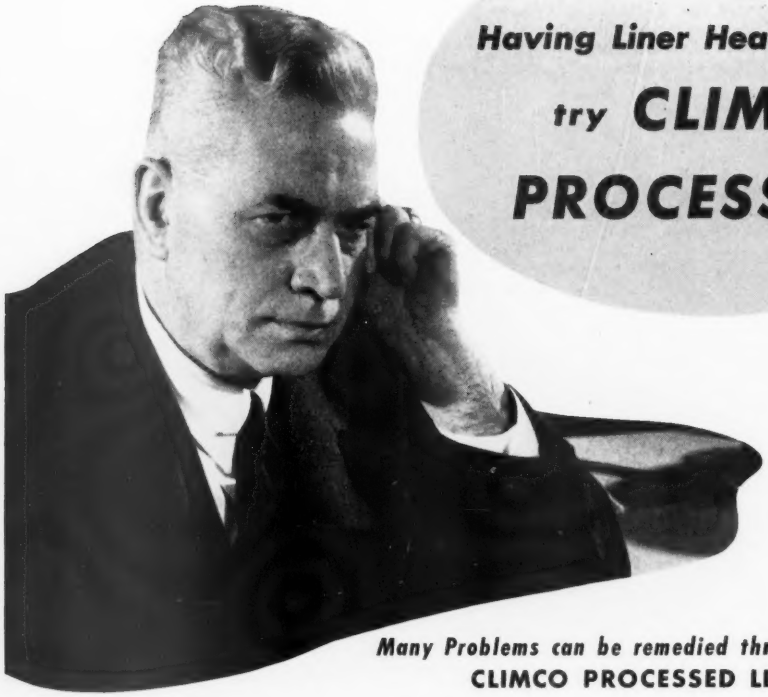
PHYSICAL PROPERTIES OF TYPICAL SHOE SOLE STOCK



GOODYEAR

We think you'll like "THE GREATEST STORY EVER TOLD"—Every Sunday—ABC Network

Pliolite—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio



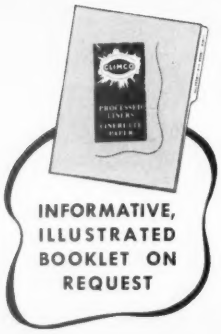
Having Liner Headaches?...

try CLIMCO PROCESSING

Many Problems can be remedied through the use of
CLIMCO PROCESSED LINERS:

- ★ Climco Processing eliminates stock adhesions — making separation of stock and liner an easy operation. This saves labor and power.
- ★ Climco Processing lengthens the life of your liners — that's important with fabric so scarce.
- ★ Climco Processing protects the stock in many ways — preserves its tackiness — cuts down rejects and stock losses due to gauge distortion.

These are *some* of the advantages of Climco Processing. We shall be glad to tell you the whole story on this proved product that has served the rubber industry for 25 years.



INFORMATIVE, ILLUSTRATED BOOKLET ON REQUEST

THE CLEVELAND LINER & MFG. CO.
5508 Maurice Avenue • Cleveland 4, Ohio, U. S. A.
Cable Address: "BLUELINER"

West Coast Representative:—MERIT WESTERN COMPANY
1248 Wholesale St., Los Angeles 21, Calif.

LINERETTE INTERLEAVING PAPER
Treatment Contains
NO OIL OR WAX
Samples on Request

CLIMCO
PROCESSED LINERS
Serving the Rubber Industry for 25 Years

covers the WATERFRONT on water-based latex materials:

- **LOTOL*** Compounded Latices—Ready to use
- **KRALAC*** Plastic Latices
- **NITREX*** Butadiene Acrylonitrile Copolymer Latex
- **SHRINK-MASTER** Process for Rendering Woolens Shrink Resistant and Long Wearing
- **LATEX** Natural and Synthetic
- **KANDAR*** Permament Finish for Textiles
- **KOLOC*** Cationic Resin Compositions for Cotton, Rayon and Wool
- **NAUGATEX*** Dispersed Chemical Compounding Ingredients for all Latices
- **KRALASTIC** Flexible Plastic Latices
- **DISPERSITE*** Aqueous Dispersion of Rubber, Reclaimed Rubber or Resins

*Registered U. S. Patent Office

Naugatuck Chemical Division of **UNITED STATES RUBBER COMPANY**

NAUGATUCK, CONNECTICUT

BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • New York • Philadelphia

Rubber Chemicals • Aromatics • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices

Source of bright, colorful VINYL UPHOLSTERY

Increased consumer acceptance of supported and unsupported vinyl upholstery attests the desirability of attractive whites and soft pastels.

In vinyl upholstery TITANOX rutile or anatase titanium dioxides impart exceptional whiteness, brightness and opacity, and their compatibility with all types of synthetic or natural polymers helps maintain natural strength.

TITANOX-A, anatase type, is suggested where whiteness is of paramount interest. TITANOX-RA—the rutile type—is recommended for outstanding whiteness at low loadings. In heavily loaded stocks and in many tints, where the tinting strength of the pure oxides is not required, the rutile-calcium pigment—TITANOX-RCHT—may be used. All TITANOX pigments maintain bright, clean tints and their fine and uniform particle size affords easy mixing and grinding for complete dispersion throughout the polymer.

Our Technical Service Department is always available to help you with your problems in pigmenting all types of natural or synthetic polymers. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; Boston 6; Chicago 3; Cleveland 15; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 9, Ore.; San Francisco 7. In Canada: Canadian Titanium Pigments, Ltd., Montreal 2; Toronto 1.

8888

® TITANOX
the brightest name in pigments

TITANIUM PIGMENT CORPORATION
Subsidiary of NATIONAL LEAD COMPANY

For long-lasting protection in light-colored flooring—

use Wing-Stay S

Long service is what you're looking for in a rubber flooring. And that's why so many flooring makers have turned to WING-STAY S as their anti-oxidant. For this Goodyear-developed non-staining anti-oxidant won't discolor even on prolonged aging.

WING-STAY S offers the best balance between non-staining, non-discoloring and anti-oxidant properties and low cost. It's been use-proved in light-colored foam stocks, whitewall tires and in a wide variety of other light-colored and white items of both natural and synthetic rubber. Users of GR-S 26 will find WING-STAY S already added when they purchase this rubber from the Office of Rubber Reserve.

Write today for full details and sample for your own evaluation to:

GOODYEAR, CHEMICAL DIVISION, AKRON 16, OHIO

USE PROVED *Products*

GOODYEAR

We think you'll like "THE GREATEST STORY EVER TOLD"– Every Sunday – ABC Network

Wing-Stay—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

Chemicals you live by

Look to DIAMOND ALKALI for PRECIPITATED $CaCO_3$

There is a DIAMOND Precipitated Calcium Carbonate to meet almost every requirement of the rubber compounder. All are chemically precipitated under accurately controlled conditions to produce the highest degree of uniformity and purity. Your nearest DIAMOND Sales Office can help in selecting the type and grade most suited to your requirements. We also suggest that you write us direct for the bulletin "Precipitated Calcium Carbonates for Rubber and Polyvinyl Compounds".

SUPER MULTIFEX*—ultra-fine particle, coated $CaCO_3$. Greatly increases tear resistance of natural rubber and GR-S and also gives good tensile strength and low modulus. Gives excellent flow properties to molded compounds.

MULTIFEX MM*—uncoated precipitated $CaCO_3$. Particle size slightly larger than SUPER MULTIFEX and therefore has slightly lower reinforcing effect. Requires less power to incorporate.

KALITE*—a semi-reinforcing coated filler which, at proper loading, will increase tear and tensile properties. Imparts specific processing advantages to calendered and extruded compounds. Provides smooth surface, reduced shrinkage, higher tube speeds with low heat generation. Recommended for highly loaded soft rubber compounds.

MILLICAL*—due to fine particle size, this uncoated precipitated calcium carbonate exerts a stiffening effect on green or uncured compounds. Prevents sagging or collapsing when cured in open steam. Recommended as primary filler in rubber floor tile.

NON-FER-AL*—an economical non-reinforcing filler for use in highly loaded compounds where low modulus is desired. Very pure. Non-abrasive.

*®

DIAMOND SALES OFFICES: New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis, Houston.
DIAMOND DISTRIBUTORS: C. L. Duncan Co., San Francisco and Los Angeles; Van Waters and Rogers, Inc., Seattle and Portland, U.S.A.; Harrisons and Crosfield, Dominion of Canada.

DIAMOND CHEMICALS FOR THE RUBBER INDUSTRY

DIAMOND ALKALI COMPANY • CLEVELAND 14, OHIO

DIAMOND ALKALI CHEMICALS

CAN **WITCO**
ASSIST
WITH YOUR PROBLEMS?

our technicians are experts in:

the use of WITCO-made
- CARBON BLACKS
- METALLIC STEARATES
- WITCARB and WITCARB R
- PROCESSING AIDS
- M R (Hard Hydrocarbon)
- SUNOLITE (Anti-sunchecking wax)

So, to assist you in the many problems that today face the rubber compounder . . . shortage of natural rubber, increased prices of raw materials, availability of compounding ingredients . . . try

WITCO's TECHNICAL SERVICE

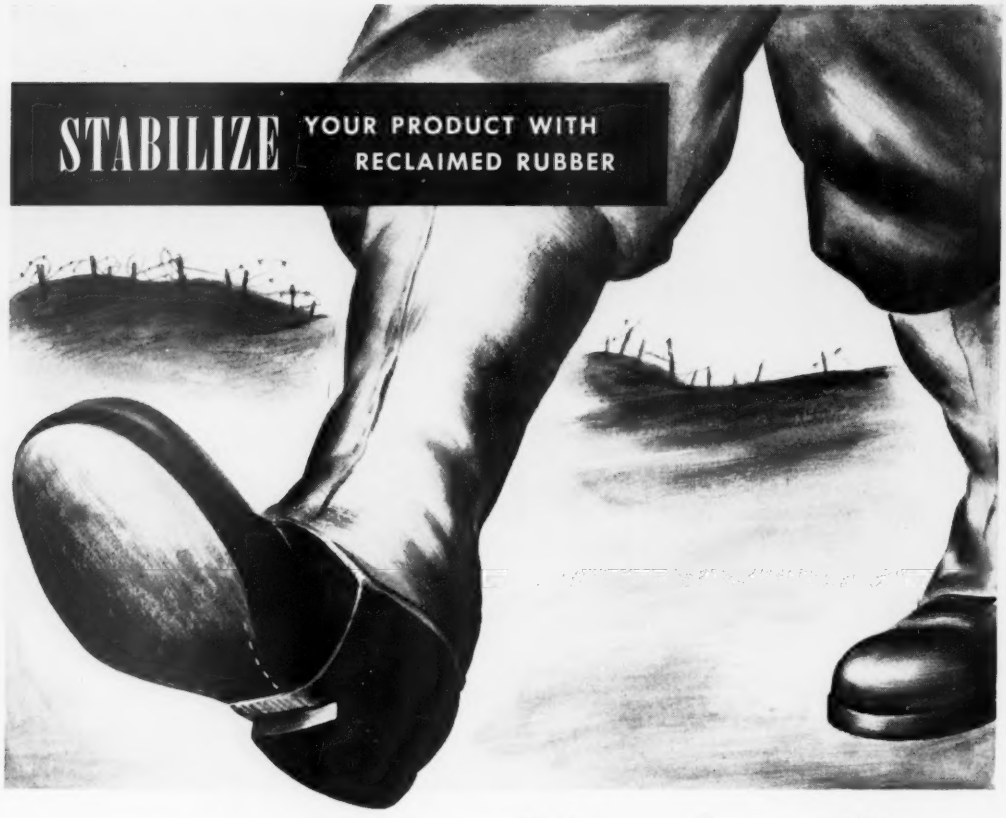
Whether it's conserving natural rubber, reformulating, or lowering costs, Witco's technical service staff is ready to put its experience to work for you. Write today.

WITCO CHEMICAL COMPANY

Continental Carbon Company

295 Madison Avenue • New York 17, N.Y.

Akron • Amarillo • Los Angeles • Boston • Chicago • Houston
Cleveland • San Francisco • London and Manchester, England



U.S. RECLAIMS help keep the U.S. *Marching Along*

. . . in spite of the shortage of rubber!

Yes, America in action . . . fighting, working or walking consumes a prodigious amount of footwear and, today, a goodly portion of that footwear is made of rubber. Current demand by the Army, Navy and civilian population for millions and millions of pairs of shoes, galoshes and various types of boots has placed a terrific strain on the production facilities of the nation's footwear industry AND — *our normal supply of rubber!* But — once again, reclaimed rubber is successfully filling the gap. Footwear manufacturers are meeting the challenge of this emergency because they learned years ago how profitable and production-wise it was to keep a substantial percentage of U. S. Reclaims in their formulae.

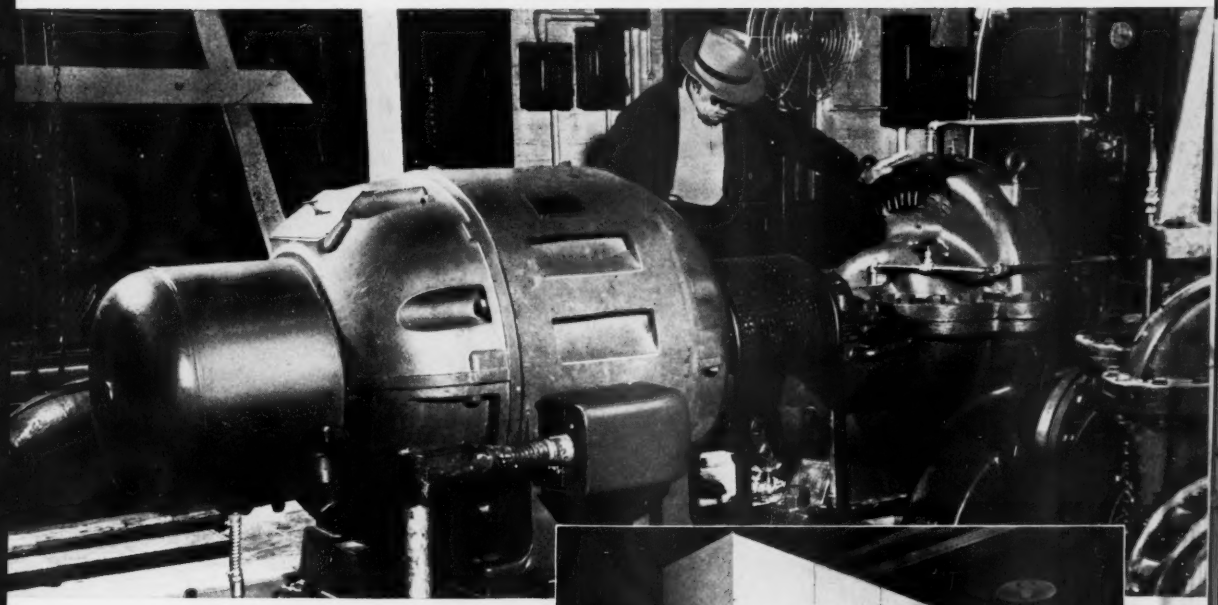
No matter what *you* make out of rubber, be it tires, battery boxes, mechanicals, garden hose or gaskets, you can STABILIZE your quality, your production and your cost by incorporating a U. S. Reclaim in your formula. In addition, you'll find that you'll get faster mixing and easier processing. So, in *your* production plans for the *future*, remember that U. S. can help you STABILIZE your product and MAKE YOUR NEW RUBBER GO FARTHER.

Always keep reclaims in your formula and always look to U. S. for the best. U. S. Rubber Reclaiming Company, Inc., P. O. Box 365, Buffalo 5, N. Y. Trenton agent: H. M. Royal, Inc., 689 Pennington Ave., Trenton, N. J.

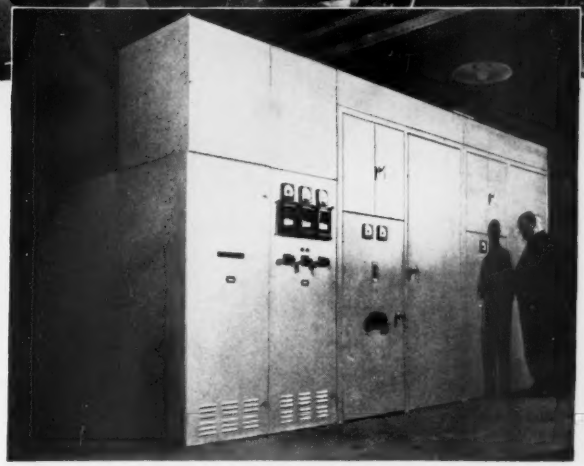
68 years serving the industry solely as reclaimers

U.S. RUBBER RECLAIMING COMPANY, INC.

Cohoes, N. Y. protects pumping plant equipment



with G-E Limitamp high-voltage control



G-E Limitamp installed at Cohoes, N. Y. for control of two 500-horsepower motors

Recently, Cohoes installed a new 500-horsepower G-E synchronous motor on a raw water pump. Before they selected control the city engineers wisely decided on a complete study of the power supply. Working with the G-E sales engineer they determined the available short circuit capacity of the system was 60,000 kva. The destructive potentialities of this power obviously called for an "insurance" that would protect their investment.

G-E Limitamp was the "insurance". It answered every need. In addition to controlling the motor, its co-ordinated design, using current-limiting EJ-2 fuses, will clear shorts in less than half a cycle—well before damage can occur to motor or control. Extra dividends in the new smaller size, protection to personnel, reduced installation, engineering, and maintenance costs are inherent in this equipment, too.

For your high-voltage installation ask for G-E Limitamp—now available in ratings up to 4800 volts with an interrupting capacity up to 250 mva. Protect your power system and motors with G-E Limitamp—more information in Bulletin GEA-5409. Ask the nearest G-E office for this bulletin or write Section 730-23, *Apparatus Dept., General Electric Company, Schenectady, N. Y.*

GENERAL ELECTRIC

730-23

The KEY to Better Plastics

HARCHEM

HARFLEX
TRADE MARK
PLASTICIZERS

The quality of a plastic is no better than the quality of the plasticizer used therein.

You can be sure of highest quality and consistent performance with HARFLEX PLASTICIZERS.

PHTHALATES ADIPATES
HARFLEX 500®
SEBACATES

BINNEY & SMITH CO. **Distributor to the Rubber Industry**

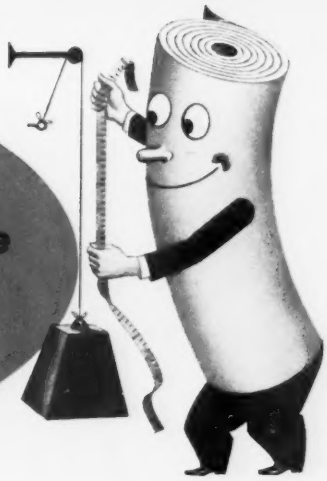
For further information and samples, write to

HARDESTY
CHEMICAL COMPANY, INC.

THE KEY TO HARCHEM BETTER PLASTICS
41 EAST 42nd ST.
NEW YORK 17, N. Y.

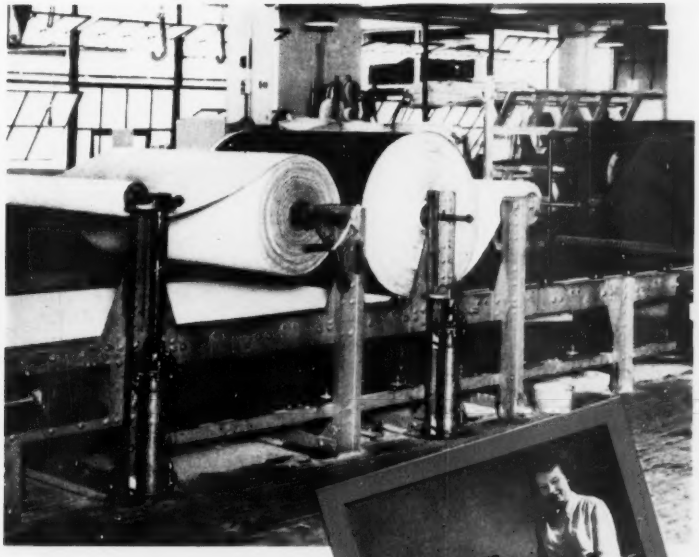
MANUFACTURERS OF SEBACIC ACID

UNIFORMITY
Makes the Big Difference in INDUSTRIAL *Fabrics*



MT. VERNON FABRICS

Give You Greater Fabric Uniformity



TESTING STRENGTH AND ELONGATION
OF YARN WITH ROLLSTOP TESTER.
This unit automatically tests 6 strands of yarn at one time. One of a series of comprehensive laboratory controls throughout production to assure fabric uniformity in all Mt. Vernon-Woodberry products.

The greater uniformity of Mt. Vernon fabrics means *consistent* quality in your finished products — smoother, more efficient fabrication.

AT YOUR SERVICE

Mt. Vernon-Woodberry's staff of textile engineers is available on request to help you with your problems in development or application of industrial fabrics.

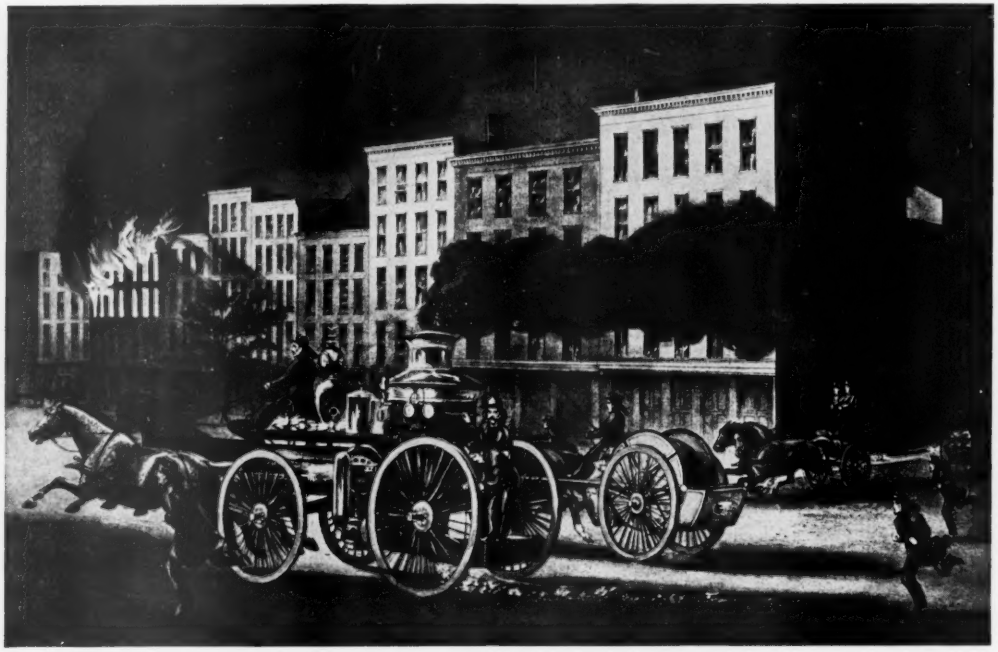
Mt. Vernon - Woodberry Mills

TURNER HALSEY COMPANY
Selling Agents
40 WORTH ST - NEW YORK

Branch Offices: Chicago • Atlanta • Baltimore
Boston • Los Angeles • Akron

PIONEERS OF THE CENTURY

(FIFTH OF A SERIES)



1882...FIRE ENGINES *Answer* THE CALL

When clanging, smoking, fire engines dramatically replaced man-drawn hand-pumpers, the work of firemen became easier and much more effective. But firefighters were not the only ones to feel the influence of engines in the 1880's. The output of workers in many fields was being multiplied many fold by the growing power of machines. The industrial age of America was at hand, bringing lighter tasks, more leisure and finer living.

The young rubber industry quickened its pace to answer the call of home and industry for more and better products. Many of those products contained high percentages of Zinc Oxide for improved physical properties, as evidenced by this well-known compound for insulating wires and cables.

To meet the expanding demand for Zinc Oxide from its two principal consuming fields—rubber and paint—The New Jersey Zinc Company in 1882 pioneered the development of Leaded Zinc Oxide for the paint industry. Its early adoption made more Horse Head lead-free Zinc Oxide available for the needs of the rubber industry.

WIRE INSULATION

India rubber	49.6%
Litharge	26.3
Zinc Oxide	15.5
Sulfur	5.3
Lampblack	3.2
Silica	0.1
	100.0%

For over a century, The New Jersey Zinc Co. has continued to pioneer outstanding developments, many of which have helped speed the progress of the rubber industry.

HORSE HEAD ZINC PIGMENTS

The Pioneer Line

Most used by the rubber industry since 1852

HORSE HEAD PRODUCTS

THE NEW JERSEY ZINC COMPANY

Founded 1848

160 Front Street, New York 38, N. Y.

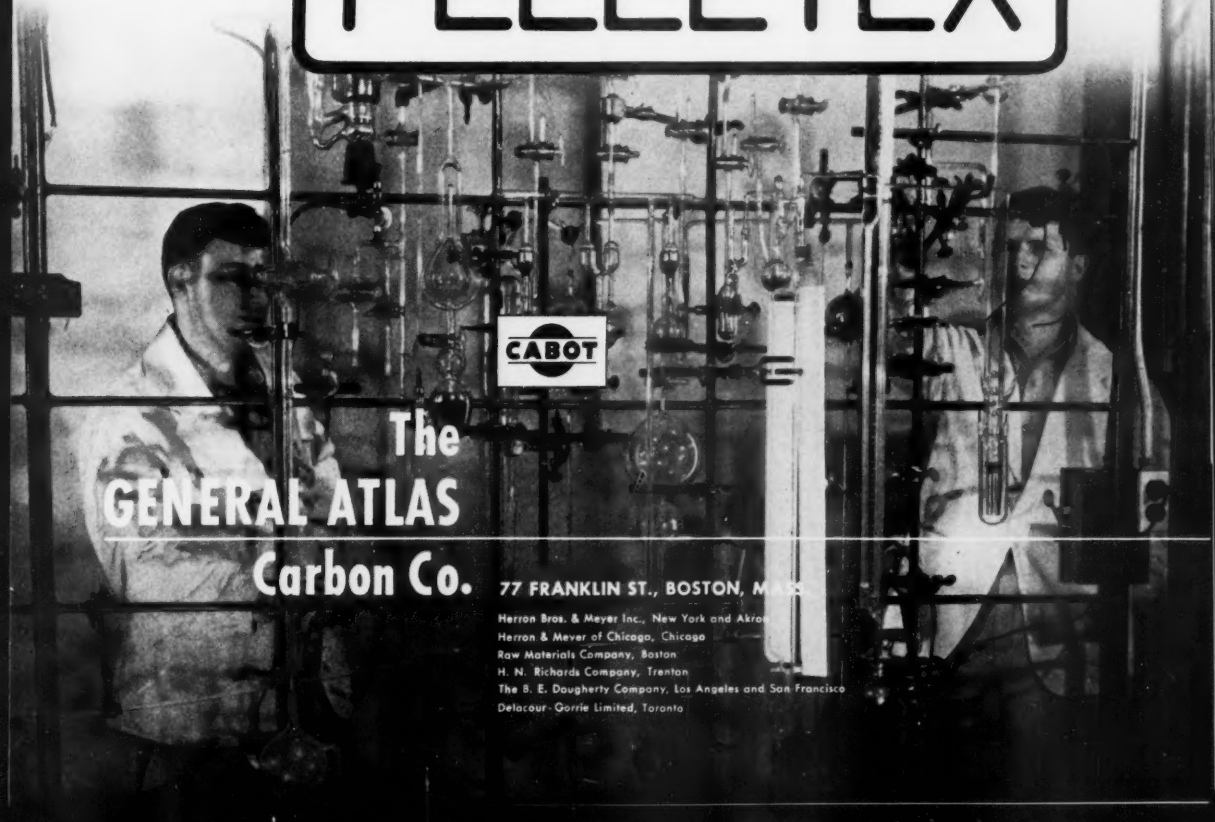
When it's PELLETEX you KNOW...

It's the BEST

A visit to a PELLETEX plant shows the latest and best refinements of process and equipment. Every step from gas to black is under scientific control. Trained engineers keep those controls keyed to perfection. Laboratory men, production men, maintenance crews, shippers and packers — all experts in their fields — work harmoniously to bring you the best in SRF carbon black — PELLETEX.

Efficiency at the plant is reflected in the uniform high quality of PELLETEX, the ideal semi-reinforcing carbon pigment for the rubber manufacturer.

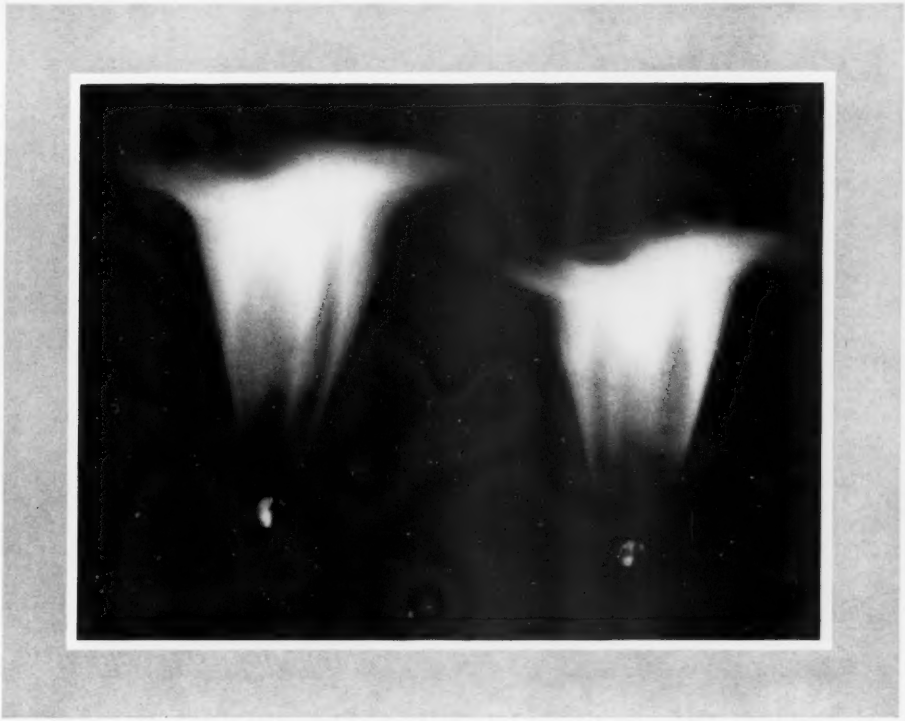
PELLETEX



The GENERAL ATLAS Carbon Co. 77 FRANKLIN ST., BOSTON, MASS.

Herron Bros. & Meyer Inc., New York and Akron
Herron & Meyer of Chicago, Chicago
Raw Materials Company, Boston
H. N. Richards Company, Trenton
The B. E. Dougherty Company, Los Angeles and San Francisco
Delacour-Gorrie Limited, Toronto

Feb. 1931-
A new page in a long record of ACHIEVEMENT
The St. Joseph Lead Company, established in 1865, is pleased to announce its production of Lead-Free Zinc Oxides. After years of intensive research devoted to the development of a high grade Zinc Oxide, it has erected and is now operating a plant for the manufacture of that product at Josephtown, Beaver County, Pennsylvania.
In St. Joe Lead-Free Zinc Oxides new and definitely higher standards have been established in uniformity, purity and fineness. Tests and commercial use by several leading rubber manufacturers have proved that St. Joe Zinc Oxide imparts to rubber superior tensiles and abrasion resistance. Its chemical and physical properties, resulting from the new and patented electrothermic process employed in its manufacture, make this the ideal Zinc Oxide for rubber manufacturers.
The same high degree of quality and service that has characterized the Company's other products will be maintained in this new product.
ST. JOE ZINC OXIDE
ST. JOSEPH LEAD CO.
250 PARK AVENUE
NEW YORK
Plant
Josephtown, Pa
Beaver County
District Sales Representa
A. L. Cothcart
Oliver Bldg. Pittsb
and now—20 years later a twelve-fold increase in ZnO production!
In February 1931, the advertisement reproduced above appeared in various trade publications. It announced the production of ST. JOE Lead-Free ZINC OXIDE for the rubber industry. The production of paint grade zinc oxides, plus additional grades for other zinc oxide consumers, was announced eight months later.
The consistent high quality of ST. JOE ZINC OXIDES resulted in ever-increasing demands for our product from regular customers. As additional consumers turned to us as a source of supply, expansion programs were initiated which increased our annual ZnO production more than twelve-fold in 20 years. While this increase may be partially due to a wider utilization of lead-free zinc oxides generally, it definitely indicates — on the part of the consuming industries — a steadily growing appreciation of the high quality and uniformity of ST. JOE Lead-Free ZINC OXIDES.
ST. JOSEPH LEAD COMPANY, 250 Park Ave., New York 17
Plant & Laboratory, Monaca (Josephtown) Pa.



MILLIONS

...of miniature factories...

United channel blacks are remarkable products wrested from hydrocarbon gases in miniature flames that are starved for air.

United channel blacks stem from over four million precisely regimented flame factories where each particle of black is refined in incandescent heat.

United channel blacks are collected by impingement in the nascent state and they retain their innate activity in support of high reinforcement of rubber.

United channel blacks have been in use for decades and have an enviable record of satisfactory performance. They are uniform, dependable, and ever in demand.

Think of channel black—United channel black—for durable rubber products.

UNITED CARBON COMPANY, INC.
CHARLESTON 27, WEST VIRGINIA
NEW YORK · AKRON · CHICAGO · BOSTON

UNITED CHANNEL BLACKS

KOSMOBILE 77 (EPC)
KOSMOBILE HM (MPC)

Think of channel black . . .

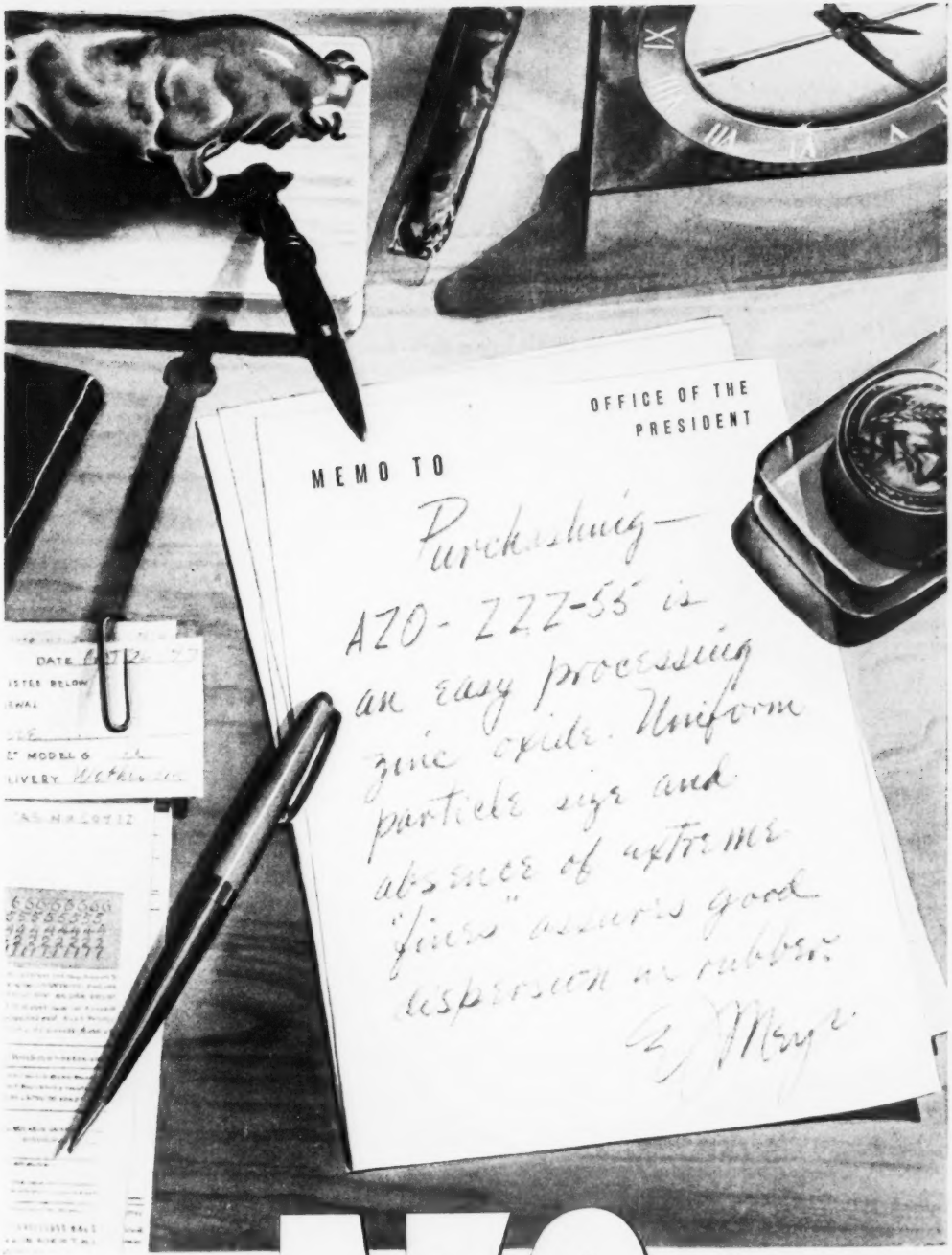
United channel black . . .

for durable rubber products.

RESEARCH DIVISION

UNITED CARBON COMPANY, INC.

CHARLESTON 27, WEST VIRGINIA



Uniform-Dependable

AZO ZINC OXIDES

AMERICAN ZINC SALES CO.

Distributors for

AMERICAN ZINC, LEAD & SMELTING CO.

COLUMBUS, OHIO · CHICAGO · ST. LOUIS · NEW YORK

COOKE

DISPERSED RUBBER

COLORS

give you

TOPS

in color value

Send for your copy of this color chart today.

COOKE COLORS ARE BEST BY COMPARISON !

They are furnished as soft dispersions of organic toner and neutral polymer. They are unsurpassed for aging properties and will stand long storage and temperature changes. COOKE COLORS have high tinctorial value and give a clean, bright tone to the finished product.

They are quality colors for use in natural or synthetic rubber and in vinyls. They will stand all cures, are non-bleeding, and assure an *exact* color control of your products. COOKE COLORS are unmatched for depth of tone, high stability, permanence, and ease of handling.

There are over 20 standard colors in the COOKE line — a color for every job. If the shade you need is not on our color chart, the colors can be blended to achieve precisely the shade you want. Or, if you prefer, we will supply reproducible blends to meet your individual requirements.

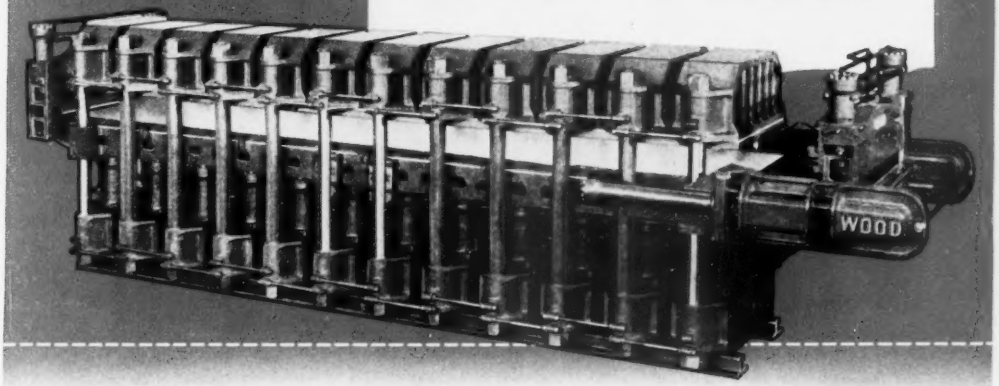
Cooke C

COOKE COLOR & CHEMICAL CO.

GLEN ROCK, NEW JERSEY

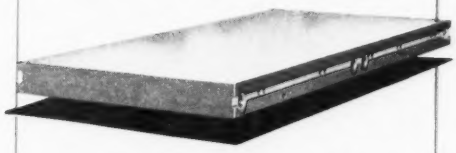
Plant and Laboratory: Hackettstown, N. J.

R. D. WOOD Hydraulic Belt Press



...FOR VULCANIZING RUBBER BELTING

What makes this WOOD Press a Good Press?



PART OF THE STORY... is the R. D. Wood press platen, a piece of precision manufacturing. Practically any degree of parallelism required is maintained within the size ranges of 7′ x 34′ or 8′ x 24′. Uniform heat distribution over top and bottom surfaces is achieved by precise drilling on special machines, carefully designed steam circulation channels. Finishes range from smooth tool to high polish, worked on specially processed fire box steel plate. Write for the full story.

THIS 3180 ton multiple-cylinder, single-opening hydraulic belt press vulcanizes rubber belting—quickly and efficiently. Hydraulic stretcher and clamping units, providing a force of 60 tons, are mounted at the ends of the moving platen to hold tension on the belt during processing. Equalizing devices insure parallel movement of the platen during full press stroke.

The 24 cylinders are arranged, with piping, into 12 2-cylinder units, any one of which can be cut out at any time, and which are interchangeable and removable without any other dismantling. Platen size is 63¼″ x 30′ x 3¾″.

This press can be made in any size. Write for information.

HYDRAULIC PRESSES AND [illegible] FOR EVERY PURPOSE
ACCUMULATORS • ALLEVIATORS • INTENSIFIERS

R.D. Wood Company

Est. 1803

This is how Mold Cleaning Departments Make Profits

Molds lubricated with Dow Corning Silicone mold release agents stay clean 5 to 20 times as long as they ever did before. That's because Dow Corning Silicones can't break down to form a carbonaceous deposit on the molds. Furthermore, mold dirt won't stick to a silicone surface. Mold maintenance is therefore reduced to the vanishing point. Molds last longer and you get easier release of parts with a uniformly better finish and sharper detail. Close tolerances are maintained at minimum cost. That's why most of the tires and a lion's share of all the mechanical rubber goods, heels and soles, floor tile and mats produced in this country are released from molds sprayed with DC Mold Release Emulsions or with a solvent solution of DC Mold Release Fluid.

FOR MOLDS THAT STAY CLEAN

SPECIFY DOW CORNING SILICONE RELEASE AGENTS

Dow Corning Silicones Mean Business!

For more information call our nearest branch office or write for data sheet M-3

DOW CORNING CORPORATION, MIDLAND, MICHIGAN

ATLANTA • CHICAGO • CLEVELAND • DALLAS • LOS ANGELES • NEW YORK • WASHINGTON, D.C.

In Canada: Fiberglas Canada, Ltd., Toronto
Great Britain: Midland Silicones Ltd., London

Dow Corning
FIRST IN SILICONES

How important is

CARBON DISULFIDE

(Bisulfide)

to your operation?

Baker, pioneers of the electro-thermic method, assures you CS_2 of highest purity and uniformity – at low cost.

SPECIFICATIONS FOR BAKER CARBON DISULFIDE TECH.

CS_2

*Boiling Range	0.5° C.
Residue After Evaporation	0.0014%
Foreign Sulfides and Dissolved Sulfur	Passes ACS Test
Sulfite and Sulfate (as SO_2)	Passes ACS Test

*Approximate Boiling Point 46° to 47° C.

STANDARD SINGLE TRIP CONTAINERS

55 gallon, 10 gallon, 5 gallon drums and Tank Cars (8,000 gallons)—approximately 85,000 pounds.

If you manufacture rayon, rubber products, rubber intermediates, matches, varnishes, insecticides—or any one of a wide variety of other products—Carbon Disulfide means a great deal to your particular process, especially if you can obtain constant uniformity and purity at low cost.

To assure you of all three of these essential qualities, Baker produces Carbon Disulfide by the unique electro-thermic method, a process invented by Taylor and improved and perfected by Baker.

This precision method . . . coupled with continuous rather than batch distillation . . . insures uniformity of the finished product. You will find Baker Carbon Disulfide exceptionally free from other sulfide impurities!

No matter what product you manufacture—if it requires a superior Carbon Disulfide of measured purity and uniformity at low cost—it will pay you to specify Baker.

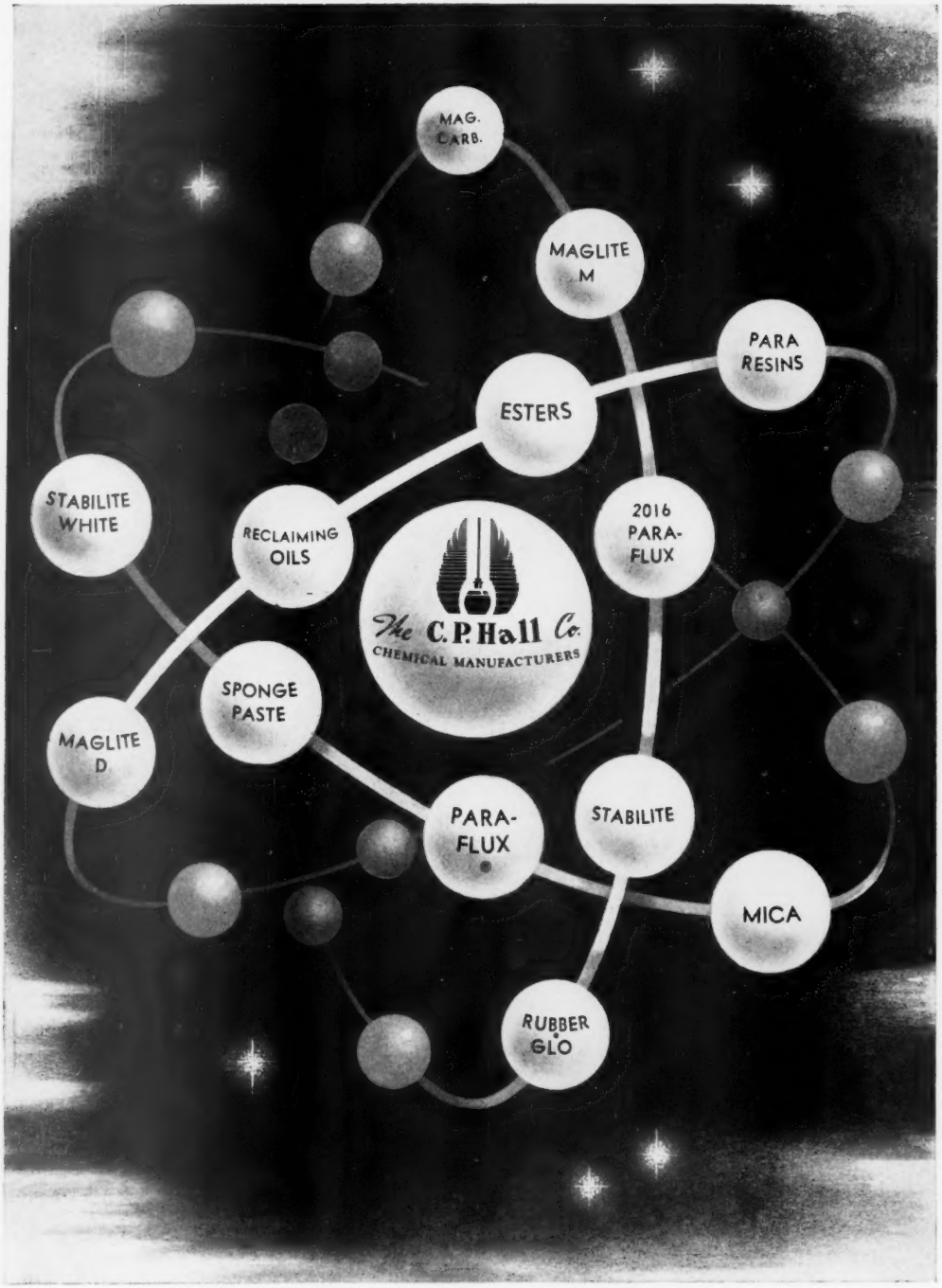
Baker is one of the principal volume producers of Carbon Disulfide. Our production is continuous . . . our sales are made in Tank Car Lots or Carloads in Drums to many of the large users. If you require Carbon Disulfide for your process work, Baker solicits your business.

Address J. T. Baker Chemical Co., *Executive Offices,* Phillipsburg, N. J.

Baker CHEMICAL

Baker Chemicals

REAGENT • FINE • INDUSTRIAL



AKRON, OHIO ● LOS ANGELES, CALIF. ● CHICAGO, ILL. ● NEWARK, N. J.

SYNTHOL

TACKIFIER and PLASTICIZER for SYNTHETIC RUBBERS

SINCE the processing time required for GR-S is far greater than that of natural rubber, milling costs have become of paramount concern. **SYNTHOL** is aiding greatly in cutting down this cost by speeding up the "breakdown" and dispersion of pigments. Smooth, nerveless, easy-processing stocks result.

SYNTHOL is vastly superior to messy oils or greases which require much time for incorporation into the rubber. **SYNTHOL** incorporates clean, easily and quickly, either on the mill or in a Banbury. Less bulk is handled, for a small amount goes a long way. Higher quality odorless stocks are produced.

ONE of the outstanding merits of **SYNTHOL** is the excellent, permanent tack it creates in the Butadiene type of synthetic rubbers, without excessive softness. Shrinkage is definitely reduced.

ONLY a small amount is required as compared with most softeners. **SYNTHOL** preserves the full strength of synthetic rubbers and gives stocks of high resiliency and low "heat build-up."

FOR RUBBER CEMENTS: **SYNTHOL** smooths out cement stocks and creates additional tack. It acts both as an extender and tackifier in rubber cements.

A LITTLE **SYNTHOL** quickly "brings back" scorched stocks of both synthetic and natural rubber. It is a unique agent for re-vitalizing "set-up" Neoprenes.

SYNTHOL is an excellent plasticizer for synthetics and when added for tack, replaces an equivalent percentage of plasticizer. Add 2 to 5% of SYNTHOL directly to the batch on the mill. It is clean and easy to use, incorporates with the rubber quickly, does not break the rubber on the roll and is assimilated almost instantly.

- **Yields smooth and tacky synthetic rubber stocks.**
- **No ply separations in built-up stocks.**
- **Highly dispersable in synthetics.**
- **Overcomes molding defects incident to dry stocks.**
- **Lowers shrinkage in raw processed stocks.**

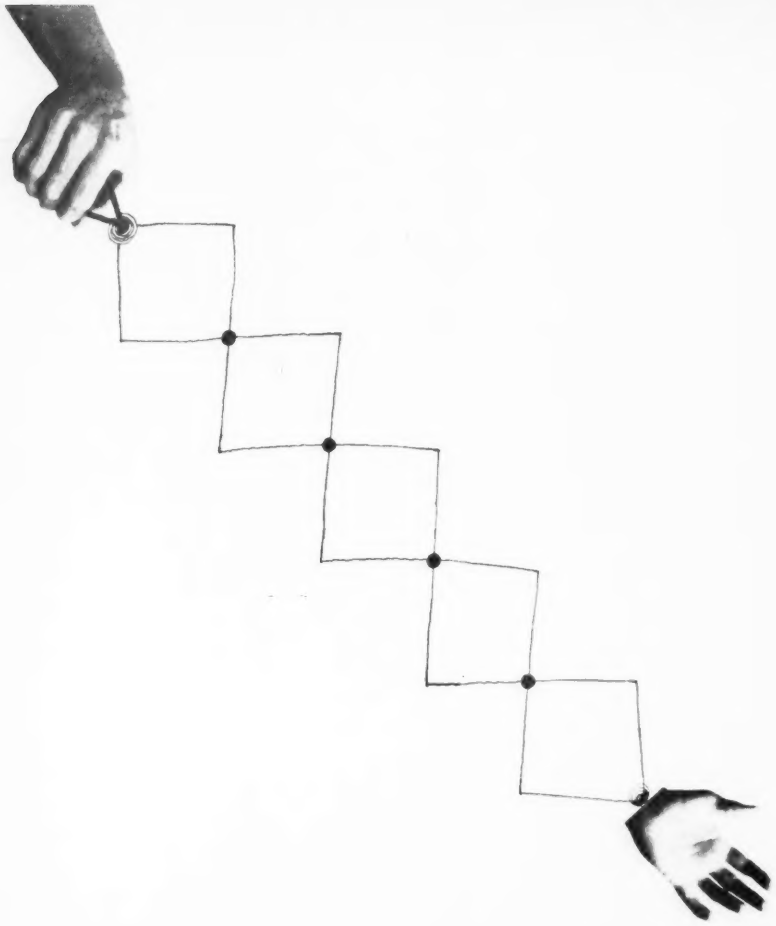
USE LESS...ACCOMPLISH MORE...WITH SYNTHOL

QUALITY SINCE 1884

GENSEKE BROTHERS

RUBBER MATERIALS DIVISION

West 48th Place and Whipple Street — Chicago 32, U.S.A.



you can extend
your crude up to 30%
with Purecal!

Crude rubber is critical and costly. That's why it makes sense to stretch it with Purecal®. Purecal U will extend your crude rubber up to 30% . . . will improve tear resistance . . . will lower costs over 14% (with no loss in tensile strength or hardness†).

Sound good? Purecal is good! Purecal M is the only calcium carbonate pure enough to add to synthetic or natural lattices without thickening or gelling. If you'd like to know more write for our booklet, "Purecal in Natural Rubber."

® Trademark

SODA ASH • CAUSTIC SODA • BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE • CHLORINE
HYDROGEN • DRY ICE • SYNTHETIC DETERGENTS • GLYCOLS
CARBOSE (Sodium CMC) • ETHYLENE DICHLORIDE • PROPYLENE
DICHLORIDE • AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS

WYANDOTTE CHEMICALS CORPORATION
Wyandotte, Michigan • Offices in Principal Cities

Wyandotte
REG. U. S. PAT. OFF.

For Quality Butyl Tubes

you need the Best

Smooth-Out Black...

CABOT

STERLING S O

SMOOTHER EXTRUSION

BETTER SPLICING

FASTER CURE

HIGHER MODULUS

LESS CHAFING

GODFREY L. CABOT INC.

77 FRANKLIN STREET, BOSTON 10, MASS.

Yes, you will profit, as have many others, if you write to EEMCO for their proposition on Rubber and Plastics Processing Machinery. Engineered right, built right and of best obtainable materials you are assured of longer life and better production when you select EEMCO. If your present or future needs include any of the machines listed below, write EEMCO for a quotation. You will like their attractive prices and quicker deliveries. Standard and custom made, of course.

MILLS
PRESSES
REFINERS
CRACKERS
LABORATORY MILLS
LABORATORY PRESSES

EEMCO *Erie Engine & Mfg. Co.*
ERIE, PENNA.

RUBBER AND PLASTIC MACHINERY DIVISION

ACCELERATOR for many kinds of compounds...

EL SIXTY

Whether you want an accelerator for surgical gloves or tractor tires, Monsanto's accelerator El Sixty will give you the performance you need.

El Sixty (Di [benzothiazyl thiomethyl] urea) offers these advantages:

- Safe handling
- Versatility
- Good performance in white or colored stock
- Ability to wade through retarding pigments
- Excellent performance in pure gum or reclaim stock
- Most stable accelerator in latex — causes no thickening in tanks
- Can be used alone or activated with Guanidines, Aldehyde-amines, Thiurams or Dithiocarbamates

For complete information and experienced assistance in your rubber chemical problems, get in touch with MONSANTO CHEMICAL CO., Rubber Service Department, 920 Brown Street, Akron 11, Ohio.

MONSANTO CHEMICALS FOR THE RUBBER INDUSTRY

ANTIOXIDANTS

Flectol H*
Santoflex* B
Santoflex BX
Santoflex 35
Santoflex AW
Santowhite* Crystals
Santowhite MK
Santowhite L

ALDEHYDE AMINE ACCELERATORS

A-32*
A-77*
A-100*

MERCAPTO ACCELERATORS

Santocure*
El-Sixty*
Ureka* C
Ureka Base
Mertax* (Purified Thiotax*)
Thiotax (2-Mercapto benzothiazole)
Thiofide* (2,2' dithio-bis benzothiazole)

GUANIDINE ACCELERATORS

Diphenyl Guanidine (D.P.G.)
Guantal*

ULTRA ACCELERATORS FOR LATEX, ETC.

R-2 Crystals*
Pip-Pip
Thiurad* (Tetra methyl thiuram disulfide)
Ethyl Thiurad (Tetra ethyl thiuram disulfide)
Mono Thiurad (Tetra methyl thiuram mono sulfide)
Methasan* (Zinc salt of dimethyl dithiocarbamic acid)
Ethasan* (Zinc salt of diethyl dithiocarbamic acid)
Butasan* (Zinc salt of dibutyl dithiocarbamic acid)

WETTING AGENTS AND DETERGENTS

Areskap* 50
Aresklene* 375
Santomerse* S
Santomerse D

SPECIAL MATERIALS

Thiocarbanilide ("A-1")
Santovar*-A
Santovar-O
Insoluble Sulfur "60"
Retarder ASA

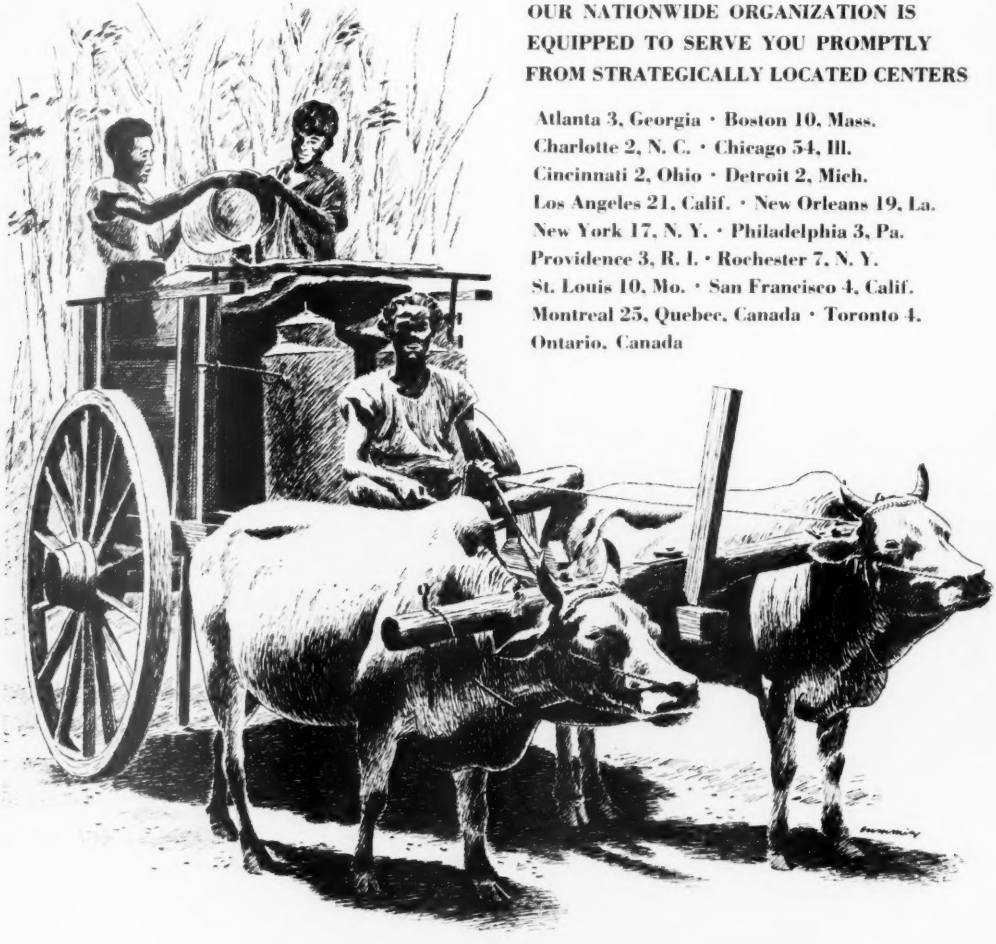
COLORS **REODORANTS**

*Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS — PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

Crude rubber
natural & synthetic latex
latex compounds



OUR NATIONWIDE ORGANIZATION IS EQUIPPED TO SERVE YOU PROMPTLY FROM STRATEGICALLY LOCATED CENTERS

Atlanta 3, Georgia · Boston 10, Mass.
Charlotte 2, N. C. · Chicago 54, Ill.
Cincinnati 2, Ohio · Detroit 2, Mich.
Los Angeles 21, Calif. · New Orleans 19, La.
New York 17, N. Y. · Philadelphia 3, Pa.
Providence 3, R. I. · Rochester 7, N. Y.
St. Louis 10, Mo. · San Francisco 4, Calif.
Montreal 25, Quebec, Canada · Toronto 4, Ontario, Canada

STEIN HALL

285 MADISON AVENUE — NEW YORK 17, N. Y.

Established 1866

Chemicals

FOR THE NATION'S DEFENSE NEEDS

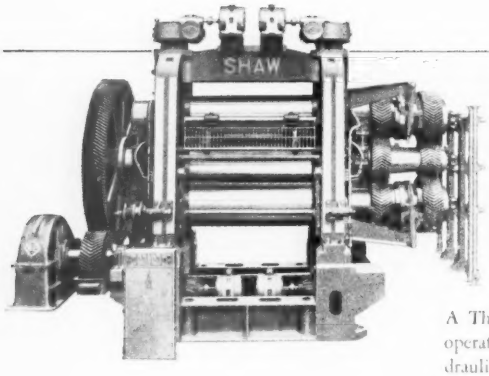
COUMARONE RESINS
PETROLEUM RESINS
ALKYLATED PHENOL RESINS
PLASTICIZING OILS
COAL-TAR SOLVENTS AND OILS
NEUTRAL AND SHINGLE STAIN OILS
RUBBER RECLAIMING OILS
CHEMICAL SPECIALTIES

THE NEVILLE COMPANY **NEVILLE** PITTSBURGH 25, PA.

Plants at Neville Island, Pa., and Anaheim, Cal.

A39

✻ KEEP IN STEP WITH THE TIMES



SHAW

In an industry as progressive as that of rubber manufacture, the engineer is constantly asked to accomplish the unknown, if not the 'impossible'. That is where SHAW experience of the whole field of rubber and plastics machinery comes in—with so many steps behind us, the next forward step comes readily to our enterprise.

A Three-roll Calender with four-motor individually power operated roll adjusting gear, push button controlled, hydraulic jacks fitted to maintain constant pressure on top roll bearings and adjusting gear.
Flood lubrication to roll bearings for high temperature work and reduction of maintenance.

FRANCIS SHAW & COMPANY LIMITED • MANCHESTER II • ENGLAND

R 199

187 Reasons why!

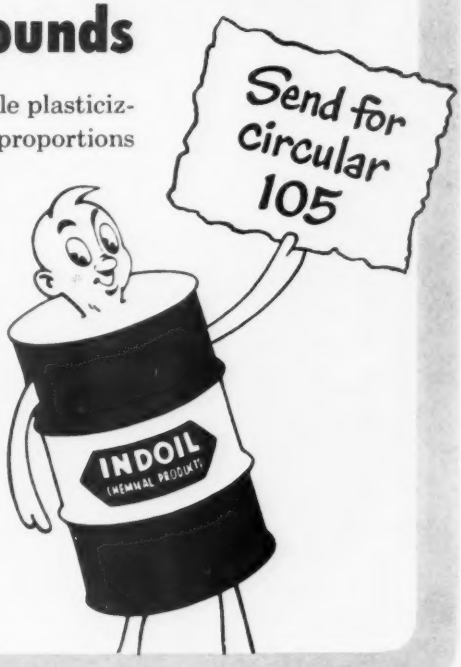
INDONEX

REG. U. S. PAT. OFF.

PLASTICIZERS

are used widely in Resin, Wax and Pitch compounds

Laboratory tests show these versatile plasticizers to be compatible in modifying proportions with 187 of 202 compounds tested.



INDOIL CHEMICAL COMPANY
910 South Michigan Avenue
Chicago 80, Illinois

OUTSTANDING PROCESSING PROPERTIES PLUS A HIGH DEGREE OF TACK

POLYMEL 6

a black, solid, friable hydrocarbon resin that provides a high degree of tack.

POLYMEL 6 is outstanding in the processing properties it imparts to GR-S, cold rubber and natural rubber compounds. It is useful in a variety of compounds but is especially efficient where building tack is required, such as tire carcass and tread compounds, camelback, footwear, braided hose, etc.

POLYMEL 6 has high insulation resistance, low capacitance and low power factor, thus making it an excellent product for wire insulation, friction and rubber tape, and hard and soft rubber electrical specialties.

Comparison in a Typical GR-S Compound with Physical Test Results

	A	B
GR-S	100.	100.
Zinc Oxide	2.5	2.5
EPC Black	45	45
Sulfur	2.	2.
Agerite Resin D	1.	1.
Santocure	1.2	1.2
POLYMEL 6	—	10.
Coal Tar Softener	10.	—

	A	B
Modulus:		
300%	920	1200
500%	2160	2540
Tensile, psi	2900	3340
Elongation, %	580	600
Hardness	63	62
Tear	250	318
Permanent Set	30	29

Optimum Cure—60 min. @ 280° F.

GOODRICH FLEXOMETER DATA

Stroke 175 **Load 175**

	A	B
Cure	60'	60'
Hardness	58	60
Height Change	—.153	—.090
Final Temperature	259	211
Static Comp.	338	274

POLYMEL 6 may also be used in reclaiming synthetic scrap by cold plasticization. For further information, write today.

Prices | **Car Loads, 7c lb.** **l.c.l., 7½c lb.** **Smaller Lots, 8c lb.** | **fob Piscataway, N. J.**

THE POLYMEL CORP.

1800 Bayard Street
Baltimore 30, Maryland
Phone: PLaza 1240

Colorful Living Begins on a Calender

An exciting new era of color has been brought to America; and modern plastics have contributed greatly to its advance. Gossamer-light but sturdy table covers and shower curtains, lovely floral drapes, gleaming dinnerware, upholstery coverings in the clear, rich tones of woven fabrics—science and skills have been developed to produce them all in plastics. No other medium offers the designer such range and richness of color, combined with other properties required for fabrication in industry.

For over 60 years Adamson United has had an important part in perfecting modern equipment and methods for the satisfactory and economical production of calendered materials.

If your plans call for new installations either of single units or of complete electronically controlled trains with all accessories, consult us. Our development, designing and manufacturing facilities are at your service.

SINCE 1892

. . . leaders in the Development, Design and Manufacture of Basic Machinery and Processes for Rubber and Plastics

Adamson United Company

730 Carroll Street

Akron, Ohio

Sales Offices In Principal Cities

Subsidiary of United Engineering and Foundry Company

Plants at: Pittsburgh • Vandergrift • New Castle • Youngstown • Canton

If it's steel wire — JOHNSON specialists make it better

Hose REINFORCEMENT WIRE

JOHNSON special bronze plated wire, for many years the preference of major tire manufacturers — now available for vacuum and defroster hose producers, in addition to conventional liquor finish wire.

- Uniformly clean finish . . .
- Maximum adhesion to rubber . . .
- Higher elongation . . .
- Extra fatigue properties . . .

Johnson line of specialty wires also includes oil-tempered and cold-drawn brush wire — tire bead wire — steel wire for field telephones — music spring wire.

JOHNSON

STEEL AND WIRE COMPANY, INC.

Worcester 1, Mass. Akron, Ohio Los Angeles, Calif.

THESE CAN'T BE SUCCESSFULLY IMITATED!

You get better heat-light protection with Advance RESIN STABILIZERS. And experienced plastics men know they can't be successfully imitated!

Over twenty years of know-how, research and carefully controlled manufacture have time-tested and proven Advance VINYL RESIN STABILIZERS' superiority. Process risks are eliminated.

If you have a particular problem, call on us. We're always on hand.

Write for Literature

ADVANCE VINYL RESIN STABILIZERS			
#3	#52	#21	E6B
V-1-N	JCX	VL-3	BC-12
OTHERS PREPARED TO FIT YOUR NEEDS			

ADVANCE SOLVENTS & CHEMICAL CORP.

245 FIFTH AVENUE, NEW YORK 16, N. Y.

UNITED ROLLS

For MILLS . . REFINERS . . . CRACKERS . . . CALENDERS . . . WASHERS

for processing RUBBER

PLASTICS . . . TILE

PAINT

LINOLEUM and other

NON-METALLIC MATERIALS

Whatever your processing requirements, our 50 years of roll making experience can help you achieve maximum satisfaction.

We'd like to prove it.

UNITED ENGINEERING AND FOUNDRY COMPANY

PITTSBURGH, PENNSYLVANIA

PLANTS AT
PITTSBURGH • VANDERGRIFT • NEW CASTLE
YOUNGSTOWN • CANTON

Subsidiaries:
Adamson United Company, Akron, Ohio
Lobdell United Company, Wilmington, Delaware
Stedman Foundry and Machine Company, Inc. Aurora, Indiana

Designers and Builders of Ferrous and Non-Ferrous Rolling Mills, Mill Rolls, Auxiliary Mill and Processing Equipment, Presses and other heavy machinery. Manufacturers of Iron, Nodular Iron and Steel Castings and Weldments.

UE&FCO
REG. T.M

IT'S "TOPS"

- **SUPERIOR ELECTRICAL TESTS**
- **HEAT STABILITY**
- **COLOR**

Sample and technical data sent promptly on request

SOUTHERN CLAYS, Inc.

33 RECTOR STREET
NEW YORK 6, N. Y.

"by HADLEY'S"

means TOP *quality*
TOP *performance*
with LOWER *production costs*

HAB-U-CO
RESIN EMULSIONS

they EXTEND and TACKIFY
all TYPES of LIQUID LATICES
SYNTHETIC or NATURAL (LATEX)
(G. R. S.-NEOPRENE-NATURAL)

A PROVEN PRODUCT MANUFACTURED UNDER CLOSE LABORATORY CONTROL

as EXTENDERS . . .

they are used to replace a high percentage of the rubber content in Latex Cements, thus lowering costs.

as TACKIFIERS . . .

they are used to modify the degree of tackiness desired in the dry cement film.

HAB-U-CO Resin Emulsions are light in color thus precluding any undue staining or discoloration of cemented surfaces.

Send Today
FOR TECHNICAL DATA AND SAMPLES
Available upon request.

SINCE 1919
HADLEY BROS.-UHL CO.
514 CALVARY AVENUE • ST. LOUIS 15, MO.

Manufacturers of CANARY LINERS

Mildew-proofing *and* Flame-proofing Cotton Fabrics as per Government Specifications. *Write or Wire for Samples and Quotations.*

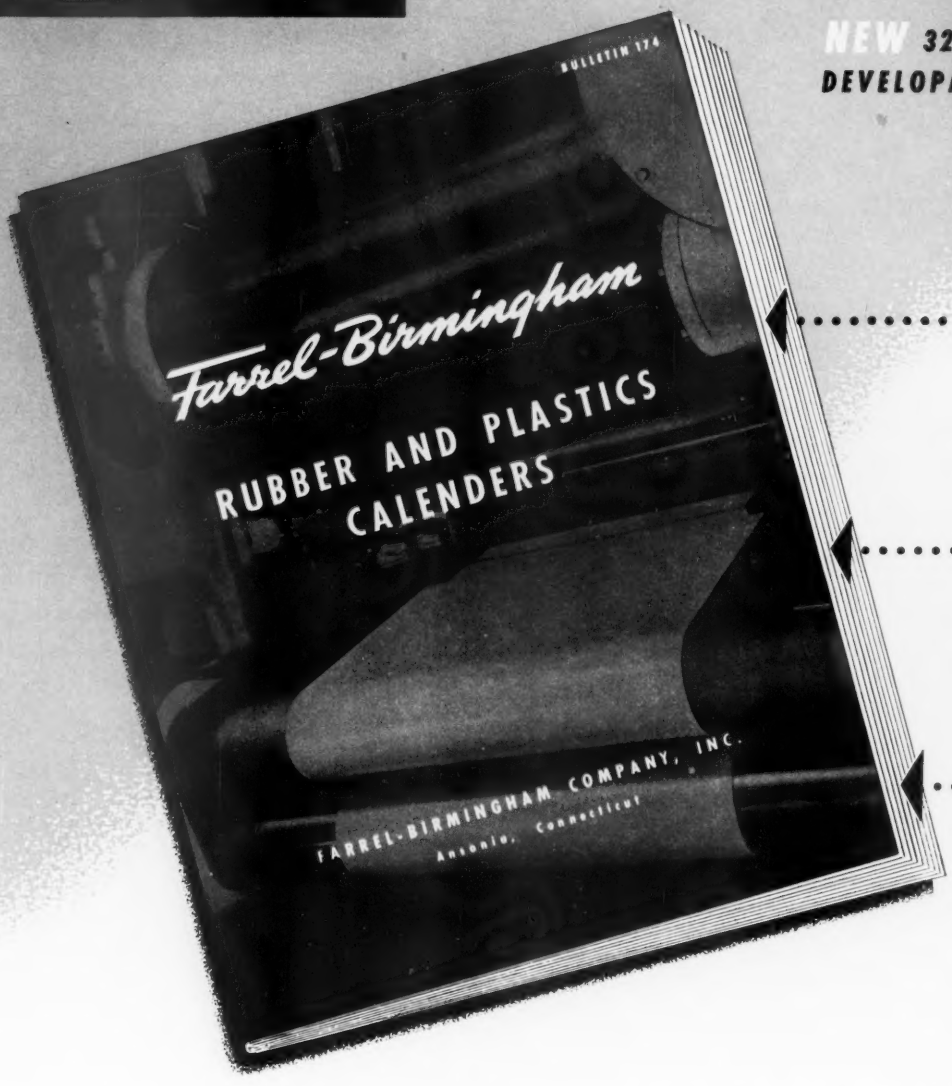
EXPORT AGENT
Binney & Smith, International, Inc.,
41 E. 42nd St., New York 17, N. Y.

CANADIAN AGENT
Binney & Smith, Limited
33 Edward St., Toronto 3, Ontario, Canada

J. J. WHITE Products Co.
7000 UNION AVENUE
CLEVELAND 5, OHIO

SEND FOR THIS GUIDE TO... SUCCESSFUL CALENDERING

NEW 32-PAGE DEVELOPMENTS



In the last few years, Farrel-Birmingham has pioneered many improvements in calender design which have resulted in products of greatly improved quality and economy of production.

Present-day textile coatings, tire cord stock, plastic film and other materials are made with an accuracy of gauge and quality of surface that were impossible to obtain with earlier type calenders. For example, the modern machine performs the delicate task of producing plastic film at high speed and high temperature, *to a gauge as thin as two thousandths of an inch, within tolerances of less than plus or minus one ten-thousandths of an inch!*

The complete story of these latest developments in calenders is contained in this new bulletin. For your free copy, just fill out the coupon and mail it today.

OF RUBBER AND PLASTICS

BULLETIN DESCRIBES THE LATEST IN CALENDER DESIGN

PAGES 6 AND 7

These two pages describe the various types and sizes of calenders built by Farrel-Birmingham. Diagrams show roll arrangements for a number of different applications.

PAGES 14 THROUGH 25

These pages give general specifications and also contain illustrations of various calenders with captions describing their applications and special features.

PAGES 16 AND 17

Here you will find illustrations and descriptions of the latest Z-type calenders, developed by Farrel-Birmingham to provide the extreme accuracy required in high-speed calendering of plastic film and some rubber products.

OTHER PAGES include parts lists for three and four-roll calenders . . . an outline of the latest improvements in calender design . . . and descriptions of Farrel-Birmingham's "Specialized Engineering Service" and its process-testing laboratory, where rubber and plastics manufacturers can explore the possibilities of new processing techniques and the development of new products.

Send For Your Copy of Bulletin 174 Today!

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y. *Sales Offices:* Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

Farrel-Birmingham®

FB-660

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONN.

Please send me, without cost or obligation, a copy of your new Bulletin 174, "FARREL-BIRMINGHAM RUBBER AND PLASTICS CALENDERS."

Name_____ Title_____

Company_____

Address_____

City_____ State_____

What Tool cuts the sweeper man-hours?

...The right brush!

The job pictured is all in a day's work for the Osborn No. 868 Master* Sweep Floor Brush. Built for industry by the company that knows industry's problems, this all-purpose floor brush is recognized everywhere for easy, fast sweeping and long life.

Well balanced, efficient Osborn Master Sweeps enable your men to cover a larger area, to clean more thoroughly and save valuable time!

Make sure your maintenance men get the best in brushing tools of all types. Order Osborn Brushes from your Industrial Distributor along with other mill supplies. *The Osborn Manufacturing Company, Dept. 404, 5401 Hamilton Avenue, Cleveland 1, Ohio.*

*Trademark

OSBORN

LOOK FOR THE NAME OSBORN . . . RECOGNIZED EVERYWHERE FOR QUALITY WORKMANSHIP AND MATERIALS

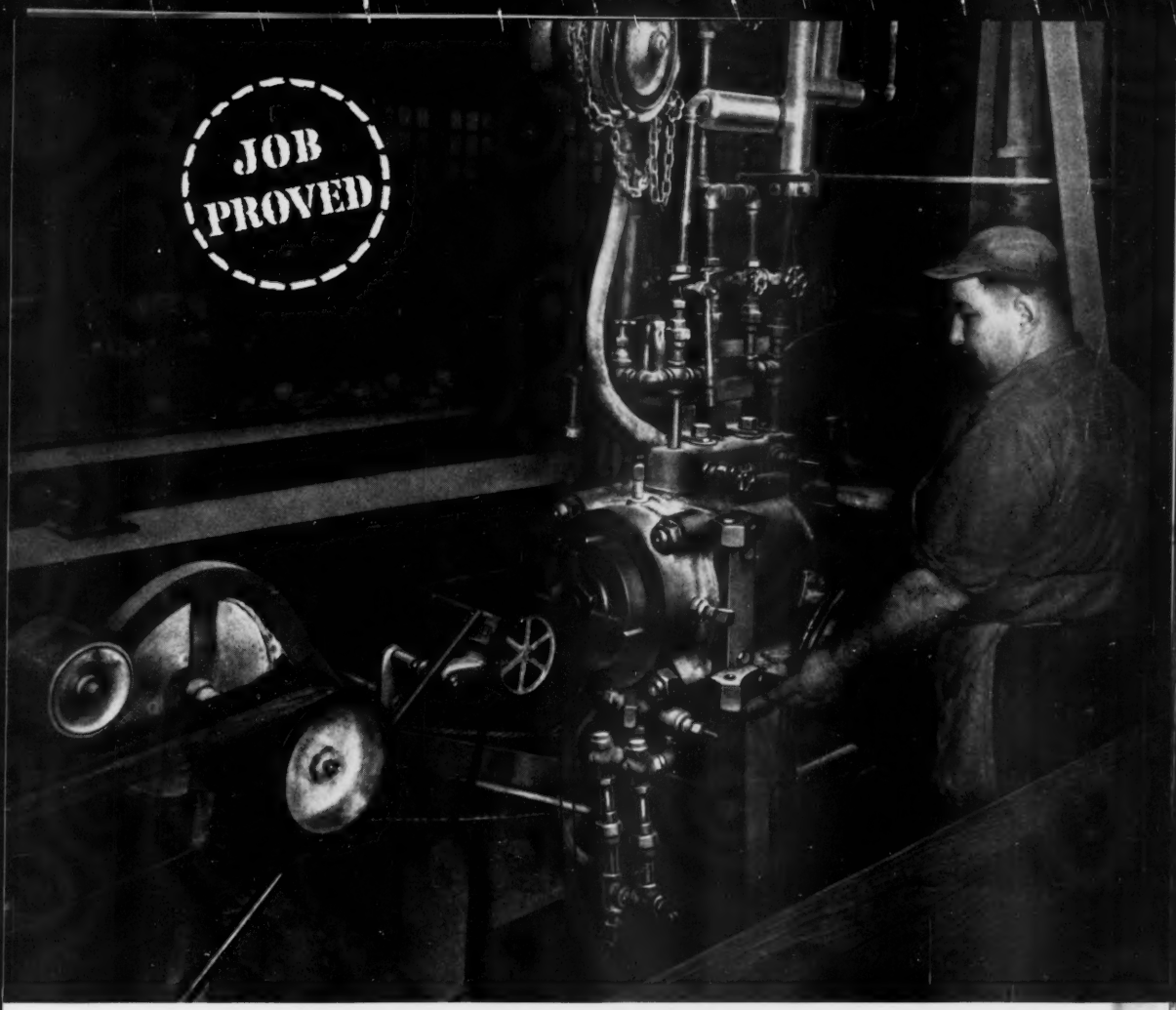
How to save purchasing time

● By ordering all your Osborn Maintenance Brushes from your Industrial Distributor, you can save countless purchasing man-hours. Grouping these orders with other mill supplies orders, you eliminate duplication of purchasing time, costly paper work and excessive plant inventory.

Why spend the time to obtain bids and delivery promises from various sources when you can buy Osborn Brushes automatically from your Industrial Distributor?

Simply specify Osborn for *all* your brush needs and have them ordered *automatically*. Your Industrial Distributor can supply the right, top-quality Osborn Brushes for every need, promptly.

There is an Osborn brush for every maintenance job



REJECTS DUE TO SCORCHING ELIMINATED

Circo Light Rubber-Process Aid Reduces Internal Heat in Stocks; Improves Plasticization, Simplifies Extruding

If rubber is plasticized right, it will extrude into tube form without scorching. But to find the perfect plasticizer is easier said than done. One well-known manufacturer of mechanical rubber goods experimented with a great many rubber-process aids before he discovered what he was looking for. Not one of them could prevent the neoprene from scorching, and the losses through rejects ran high.

The problem was solved by Circo Light Rubber-Process Aid, recommended by a Sun technical man. By properly conditioning the stock, making it easier to work, this "Job Proved" Sun product speeded up the extruding process, and prevented scorching. Operating speeds increased. Quality improved. Rejects dropped to a minimum. And whites did not stain. The company has been using "Circo" for many years now with excellent results on neoprene, reclaim, and GR-S stock.

Circo Light Rubber-Process Aid is not an ordinary petroleum-base oil. It is a "Job-Proved" petroleum-derived process aid made under precisely controlled conditions specially for rubber compounding. It has a high degree of naphthenicity and its composition is held to such close limits that there is minimum danger of getting varying results in production.

For full information about any of Sun's Rubber-Process Aids, call or write the nearest Sun Office.

SUN OIL COMPANY · *Philadelphia 3, Pa.*

In Canada: Sun Oil Company, Ltd.
Toronto and Montreal

SUN PETROLEUM PRODUCTS

"JOB PROVED" IN EVERY INDUSTRY

SUNOCO®

RUBBER & PLASTICS MACHINERY BULLETIN

Reporting News and Machine Design Developments

IN BUSINESS TO **NRM** REDUCE YOUR COSTS

CHANGE MILL GUIDES ON NRM LABORATORY MILL IN 3 MINUTES

On NRM's Model 48 Laboratory Mill, stainless steel mill guides of advanced design permit change in set-ups, or replacement for cleaning, in three minutes or less.

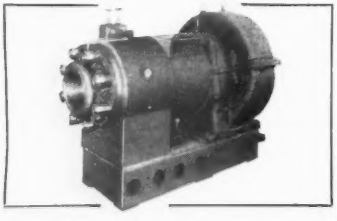
Such attention to the research man's problems is inherent in NRM mills, which have been designed in cooperation with leading industrial research laboratories and government and university laboratories.

NRM mills are available with roll diameters of 4″, 6″, or 10″, for roll lengths of 9″, 12″, or 20″. The forged steel rolls are mounted in tapered roller bearings. Leakproof pressure joints with internal piping eliminate the need for packing.

The mills are fully enclosed, suitable for use on high-temperature milling. A knee safety stop and a plugging safety stop are provided.

NRM's line of laboratory mills, calenders, washers, tubing machines and allied equipment provide tools for sound, accurate research. For full information, write National Rubber Machinery Company, 47 West Exchange Street, Akron 8, Ohio.

Accessibility Feature of New NRM Tubers



This NRM Model 50, 8″-diameter screw machine is the first of a new line of NRM extruders designed for easy access to parts and neat appearance.

Drain valves are externally mounted and can be operated easily. A sump in the bottom of the cylinder jacket permits easy removal of sludge, preventing loss of efficiency in heating or cooling. The unit is equipped with a flanged liner which can be readily removed. Pockets which might collect dust and dirt have been eliminated.

30 per cent additional thrust capacity is provided in the drive. Heavy-duty herringbone gears are used. For additional information write National Rubber Machinery Company, 47 West Exchange Street, Akron 8, Ohio.

NEW NRM TWO-STAGE EXTRUDER ELIMINATES INITIAL COMPOUNDING AND DRYING

Another NRM "first" to further simplify extruding operations . . . to save on production time . . . to cut your manufacturing costs. Once again the pioneer in its field, the new NRM Two-Stage Extruder introduces a new development for drying and extruding pre-blended wet acetate acrylic and polystyrene compounds to be pelletized direct at the die or in a chopper.

By eliminating the need for initial compounding and drying, it now becomes possible for any plant to mix its own compounds to customer's specifications and at lower cost. In addition, less expense is involved for maintenance and labor formerly needed to operate more expensive equipment.

Premium costs of specially mixed short orders are no longer necessary. Compounds can be quickly made from a simplified inventory of basic materials such as resins, plasticizers, stabilizers, fillers and dies.

Substantial savings in production time can be realized also with the new NRM Two-Stage Extruder. Shorter delivery can be quoted since reliance on outside sources for availability of ingredients and compounds is avoided.

The first single screw extruder to incorporate colloiding, devolatizing and extruding, this new development is similar in design and operation to standard NRM plastic extruders. Existing NRM extruders now operating in the field can be modified to incorporate the many time and cost saving features of the new NRM Two-Stage machine. For complete details, simply write Plastics Machinery Division, National Rubber Machinery Company, Akron 8, Ohio.

NATIONAL RUBBER MACHINERY CO.

General Offices & Engineering Laboratories
Akron 8, Ohio

PLANTS at Akron and Columbiana, Ohio and Clifton, N. J.
AGENTS East: National Rubber Machinery Co., Clifton, N. J.
West: S. M. Kipp, Box 441, Pasadena 18, Calif.
EUROPE Rubber Machinery: GILLESPIE & COMPANY
96 Wall Street, New York 5, N. Y.

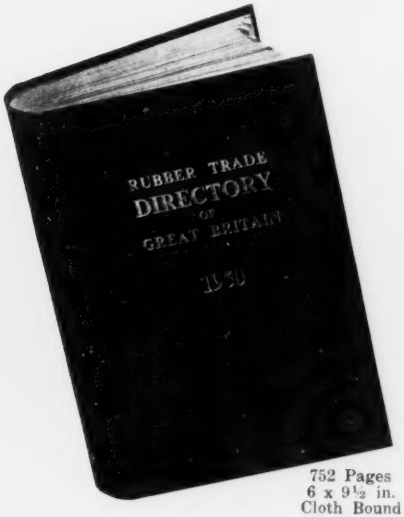
Creative Engineering

Calco®

American Cyanamid Company

CALCO CHEMICAL DIVISION
INTERMEDIATE AND
RUBBER CHEMICALS DEPARTMENT
BOUND BROOK, NEW JERSEY

SEE REVERSE SIDE



752 Pages
6 x 9½ in.
Cloth Bound

FIRST EDITION

1950 RUBBER TRADE DIRECTORY of GREAT BRITAIN

AVAILABLE NOW

CONTENTS IN BRIEF:

British Rubber Manufacturers & Products
Machinery & Equipment Suppliers
Instrument & Laboratory Equipment Suppliers
Chemical & Compounding Ingredients Suppliers
Fabric & Textile Suppliers
Component Suppliers
Natural Rubber & Latex Suppliers
Synthetic Rubber & Latex Suppliers
Reclaimed Rubber Suppliers
Scrap Rubber Suppliers
Miscellaneous Services
Trade Marks & Brand Names
Overseas Agents
Technical Schools & Courses
Trade & Research Organizations
Consultants
Who's Who in the British Rubber Industry

Here for the first time is a Directory of the rubber industry in Great Britain providing complete details on all branches of the manufacturing field, as well as on suppliers of chemicals, machinery, etc.

As an added convenience, both the Table of Contents and the Classified Index are printed in English, French, German and Spanish.

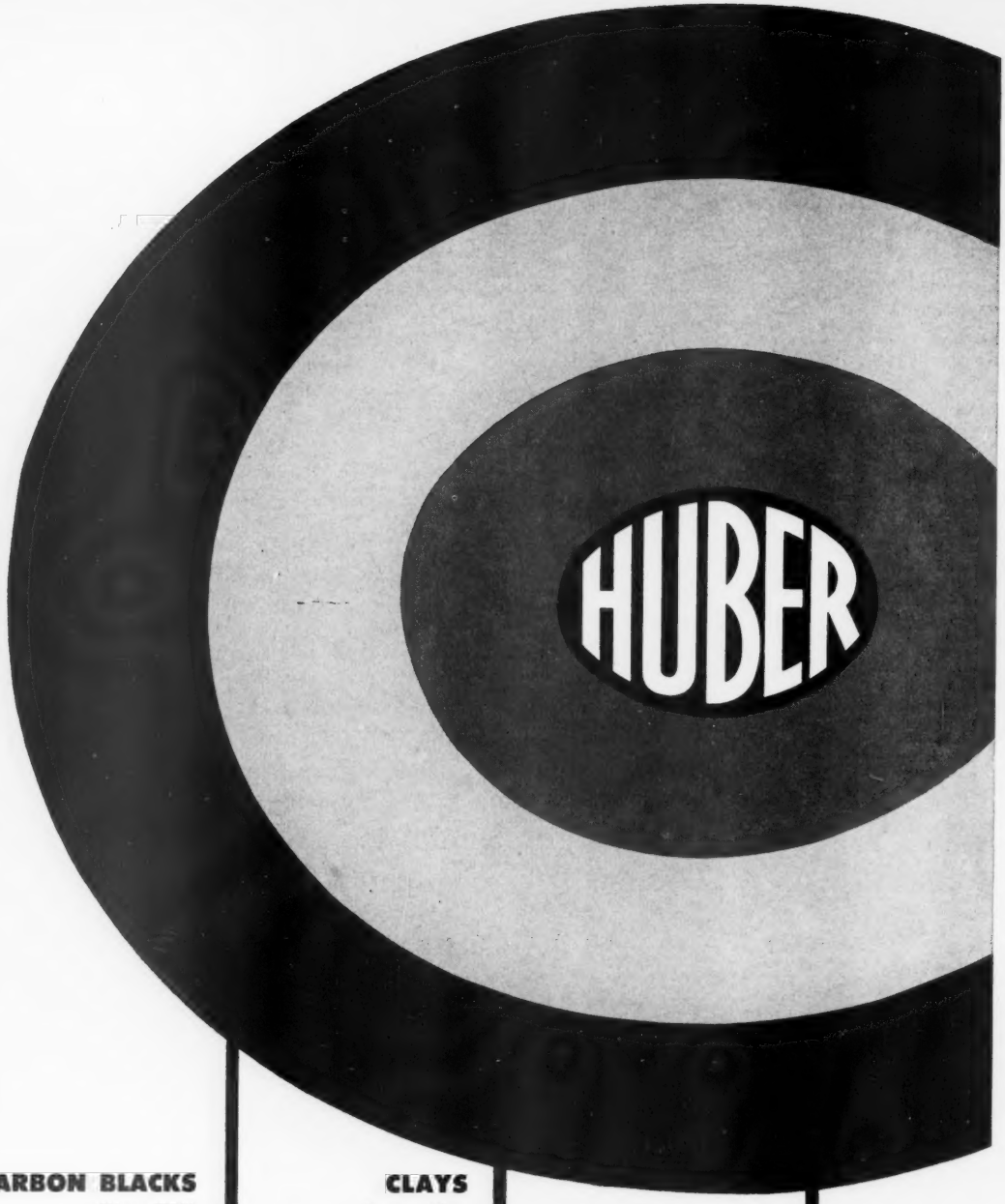
Basically patterned after the RUBBER RED BOOK, the 1950 RUBBER TRADE DIRECTORY OF GREAT BRITAIN was compiled by the staff of the India-Rubber Journal (London).

This directory is sold in the United States and Canada by RUBBER AGE and is available for immediate delivery.

Price: $9.00* (postpaid)

** add 2% Sales Tax for copies sent to New York City*

RUBBER AGE
250 West 57th Street,
New York 19, N. Y.



CARBON BLACKS

Wyex (EPC)
Easy Processing Channel Black
Arrow TX (MPC)
dium Processing Channel Black
Essex (SRF)
Semi-Reinforcing Furnace Black
Modulex (HMF)
High Modulus Furnace Black
Aromex (HAF)
High Abrasion Furnace Black

CLAYS

Suprex Clay
High Reinforcement
Paragon Clay
Easy Processing
Hi-White R
White Color
Hydratex R
Water Fractionated
RX-43
Water Fractionated (Super)

RUBBER CHEMICALS

Turgum S, Natac, Butac
Resin-Acid Softeners
Aktone
Accelerator Activator

J. M. HUBER CORPORATION, 100 Park Ave., New York 17, New York

RUBBER AGE

VOLUME 68
NUMBER 6

One of the World's Outstanding Rubber Journals

M. E. LERNER
Editor

B. J. KOTSHER
Associate Editor

JOSEPH H. JACOBSON
Production Manager

HARRIET K. COLE
Circulation Manager

CHARLES T. JANSEN
Advertising Manager

LOIS S. HOPKINS
Asst. to Advertising Manager

PETER P. PINTO
General Manager

MICROFILMS

Microfilm copies of complete volumes of RUBBER AGE are available from University Microfilms, 313 N. First St., Ann Arbor, Mich.

Also Publishers of:

RUBBER RED BOOK
Directory of the Rubber Industry Published Biennially

ANNUAL BIBLIOGRAPHIES OF RUBBER LITERATURE
Compiled by D. E. Cable, Ph.D. For Years 1935-1939

LATEX IN INDUSTRY (Out of Print)
By Royce J. Noble, Ph.D.
Text Book on Latex

LATEX AND ITS INDUSTRIAL APPLICATIONS (Vol. I) (Out of Print)
By Frederick Marchionna
Bibliography of latex patents and literature to June, 1932.

LATEX AND RUBBER DERIVATIVES AND THEIR INDUSTRIAL APPLICATIONS (Vols. II & III)
By Frederick Marchionna
Bibliography of latex patents and literature from June, 1932, to January, 1937; rubber derivatives to January, 1937.

CONTENTS FOR MARCH, 1951

Shape Factor and Other Fundamental Properties of Carbon Black—*By Leonard H. Cohan and John H. L. Watson* 687

Electrofilm Graphite Coating Processes 698

Butyl Acrylate-Acrylonitrile Rubbers Resistant to Heat, Oils and Low Temperatures—*By T. J. Dietz and J. E. Hansen* 699

Panel Discussion on Quality Control by Statistical Methods (Sponsored by the Akron Rubber Group at Its Meeting on February 2, 1951) 701

A Safety Device for Use with Laboratory-Size Rubber Mills —*By A. J. Poynton* 707

Rubber Manufacturing Activities in Foreign Countries ... 708

REGULAR DEPARTMENTS

Book Reviews	744	Los Angeles News	—
Canadian News	734	Names in the News	720
Chemical Prices	*	New Equipment	738
Classified Ads	760	New Goods	735
Coming Events	713	Obituaries	736
Editorials	709	Rubber, Cotton Markets	750
Financial News	730	Statistics	752

* Appears every other month

Published on the 15th of each month by

PALMERTON PUBLISHING COMPANY, INC.

Printing Office,
East Stroudsburg, Pa.

Editorial and Advertising Offices,
250 West 57th St., New York 19, N. Y.

New England Representative—F. ROYAL CAREY, P.O. Box 133, Providence, R.I.

Midwestern Representative—JOHN P. O'KEEFE, 141 West Jackson Boulevard, Chicago 4, Ill. Phones: Webster 9-2442, Wabash 2-8141.

News Correspondents—A. L. PICKARD, c/o Braun Corporation, 2260 East 15th St., Los Angeles 21, Calif. PHIL GLANZER, Tivoli Theatre Bldg., Toronto 1, Canada.

Entered as Second Class Matter, October 20, 1933, at the Post Office at East Stroudsburg, Pa., under Act of March 3, 1879. Subscription Rates: Domestic, $3.00 a year; Canada, $3.50; Foreign, $4.00. Single copies up to 3 months old, 35 cents; over 3 months old, 50 cents. Telephone COlumbus 5-2923, 5-2924.

Contents Copyrighted 1951 by the Palmerton Publishing Company, Inc. Indexed in Industrial Arts Index and Engineering Index.

OFFICERS: P. L. Palmerton, President; E. D. Osborn, Vice-President and Secretary; Peter P. Pinto, Treasurer.

Announcement...

Naugatuck Chemical is now producing and distributing

PARACRIL

An Acrylonitrile — Butadiene Polymer... outstanding for its resistance to oils and gasolines

PARACRIL B
General Purpose Oil Resistant Type— Excellent Heat Resistance.

PARACRIL-BJ
Same General use as "B" but lower plasticity and easier processing.

PARACRIL-C
Maximum Oil Resistance. Excellent heat resistance and aging properties.

Price list available upon request

Process · Accelerate · Protect
with
NAUGATUCK CHEMICALS

Naugatuck Chemical DIVISION OF UNITED STATES RUBBER COMPANY

NAUGATUCK, CONNECTICUT

IN CANADA: NAUGATUCK CHEMICALS DIVISION • Dominion Rubber Company Limited, Elmira, Ontario

RUBBER CHEMICALS · AROMATICS · SYNTHETIC RUBBER · PLASTICS · AGRICULTURAL CHEMICALS · RECLAIMED RUBBER · LATICES

RUBBER AGE

Vol. 68, No. 6 MARCH, 1951

Shape Factor and Other Fundamental Properties of Carbon Black

By LEONARD H. COHAN
Hanline Bros., Paint Makers, 1400 Warner St., Baltimore 30, Md.
and JOHN H. L. WATSON
Edsel B. Ford Institute for Medical Research, Detroit 2, Mich.

EARLY electron microscope pictures indicated that carbon blacks are almost always observed as chains of roughly spheroidal units rather than discrete particles. The tendency of a black to show such chain-like configuration has been referred to as its "structure" *(1)*. Recent papers *(2, 3, 4)* have indicated that the characteristic high modulus and high hardness of furnace and channel blacks can be explained in part by assuming that they are composed of "particles" which behave not too differently from long, narrow rods of a definite shape factor. The shape factor is defined as the ratio of the length to the diameter of the cross section of the rods. Whether the units present in these "particles" are held together by chemical or by Van der Waals or even electrical forces is not yet definitely known, but the evidence suggests that they are held together with sufficient strength to preserve their integrity throughout most of the operations involved in commercial processing and rubber compounding.

In this paper the shape of these particles has been determined for representative carbon blacks from electron micrographs. The shape factors obtained from modulus and hardness determinations in elastomers agree fairly well with the electron micrograph results. Specific surface areas have also been calculated from the electron microscopic data and compared with low temperature nitrogen adsorption areas and with other physical properties of the carbon black. This investigation constitutes the first attempt to study aggregation or inter-particle relationships in a particulate material with the electron microscope and to put such information on a quantitative basis.

Nature of Carbon Black

Carbon black may be described conveniently in terms of the five structural elements which are listed below in order of increasing size. The definitions of the various elements as given here will be used throughout this paper because they furnish a terminology which is very helpful in obtaining an understanding of the nature of carbon black. The symbols used in this paper are listed in Table I.

1. *Ultimate Graphite Layer:* An ultimate layer is composed of an essentially planar arrangement of carbon atoms in a network of hexagonal rings (Figure 1A). The configuration in these planes and the value of a is similar to that in graphite, but the L_a distance has smaller dimensions in carbon black. The L_a and a dimensions vary for different blacks, and their average values may be determined by the methods of x-ray line broadening *(5)*.

2. *Crystallites:* A number of ultimate layers arranged as a parallel layer group (Figure 1B) constitute a crystallite. The average thickness, L_c, of the whole crystallite and the distance, c, between alternate graphite layers can be determined by x-ray diffraction techniques and from these data the number of layers can be calculated. The value of c is approximately the same as in

TABLE I—KEY TO SYMBOLS

a = the distance between centers of adjacent carbon atoms in the plane of the graphite layers.

α_1 = correction to F_1 for non-linearity of the chains in the plane = L_p/l averaged over a statistically significant number of particles.

α_2 = correction to F_1 for orientation of the chains at an angle to the film (see note on calculation of α_2).

$\bar{b}$ = mean minor axis of the ellipsoidal units.

β = angle subtended by the contact area between two spheroidal units.

c = twice the distance between adjacent graphite layers.

d = maximum diameter of an ellipsoidal unit.

$\bar{d}$ = arithmetic mean of the maximum ellipsoidal unit diameter (major axis of the ellipse) for the whole distribution.

$\bar{d}_i$ = the center of the ith class of ellipsoidal units.

$\bar{d}_c$ = mean of the d values for a single, chain-like particle.

$\bar{d}_g$ = geometric mean of d for the whole distribution.

$\bar{d}^2$ = arithmetic mean of the individual ellipsoidal unit diameters, d, squared.

$\bar{d}^3$ = arithmetic mean of the individual ellipsoidal unit diameters, d, cubed.

e = ellipticity correction = $(d + b)/2\bar{b}$ averaged over a distribution of ellipsoidal units.

f = shape factor (ratio of length to the diameter of the cylindrical rods which have the same effect on elastic constants as the ultimate particles) of a rubber pigment, which gives the best agreement between Equation 2 and the experimentally determined modulus vs. volume concentration curve.

F = electronmicroscopically determined equivalent shape factor of the black = $\dfrac{F_1 + F_2}{2}$

F_1 = equivalent minimum shape factor calculated from the average of l/d_c for a statistically significant number of chains. F_1 is a minimum value for the shape factor since l is a minimum for the chain length.

F'_1 = equivalent minimum shape factor calculated from $\bar{l}/\bar{d}$ for a statistically significant number of chains.

F_2 = maximum equivalent shape factor for a statistically significant number of chains.

h = maximum height of a particle above the plane of the supporting film.

$\bar{h}$ = mean of the maximum heights of the distribution of particles.

h_s = maximum shadow length of a particle.

k = ratio of surface area of a non-spherical unit, for example an ellipsoid of major axis d, to the area of a sphere of diameter d.

l = length of the two dimensional projections of a chain observed in an electron micrograph measured as the crow flies, not along the chain.

$\bar{l}$ = mean of the l values.

L = length of a chain measured along the chain in three dimensions.

$\bar{L}$ = mean of the L values.

L_a = the average dimension of a crystallite in the plane of the graphite layers.

L_c = the average thickness of a crystallite; that is, the average dimension normal to the plane of the graphite layers.

L_p = length of the two dimensional projection of a chain measured along the chain.

$\bar{L}_p$ = mean of the L_p values.

M = modulus of elasticity of a pigmented rubber compound.

M_0 = modulus of the elastic matrix itself in the absence of pigment.

n = number of units measured.

n_i = number of units in the ith class measured.

N = number of chain-like particles measured.

ρ = density of carbon black in grams per cc.

S = specific surface area in square meters per gram.

S' = specific surface area assuming that the units are spheres.

S'' = specific surface area assuming that the units are spheres of uniform diameter.

V = ratio of the volume of a non-spherical unit, for example an ellipsoid of major axis d, to the volume of a sphere of diameter d.

graphite but L_c is much smaller. Among the blacks themselves L_a and L_c, i.e., the size of the crystallite, may vary considerably from one type to another.

In carbon black a given ultimate layer is oriented with respect to the immediately adjacent layers so that it is parallel and equidistant in the crystallite, but the layers are randomly oriented about the perpendicular to their faces *(5, 6)*. On the other hand, for graphite the orientation is precise and three-dimensional, with the planes parallel and one carbon atom either directly above another carbon or above the center of an hexagonal ring *(7)*.

3. *Ellipsoidal Units:* Ellipsoidal units are the structural elements most frequently referred to in the literature, where they are usually called "particles" of carbon black. The word, particle, will be reserved here for another purpose. An ellipsoidal unit may be composed of from a few hundred to many thousand crystallites, as illustrated in Figure 1C, or of only one or two *(8, 9)*. The units are the smallest physical structures of carbon black which have been reported in electron micrographs; however, recent work has indicated substructures both within and over the surface of the units *(10)*. In a few instances units with sharp corners and flat surfaces have been observed, but smooth, rounded contours are the rule with most blacks at present resolution.

The external specific surface area may be determined approximately from the diameter distribution of these units *(9)*. For non-porous blacks the specific surfaces from diameter distributions are in fairly good agreement with the values obtained from nitrogen adsorption experiments *(11)*. The amount of surface made inaccessible to a nitrogen molecule by virtue of the touching of the units, or their actual joining unit to unit, is small in most cases. The forces between crystallites are so considerable that there is no evidence that ellipsoidal units are ever disrupted in appreciable quantities.

Although some of the ellipsoidal units are very close

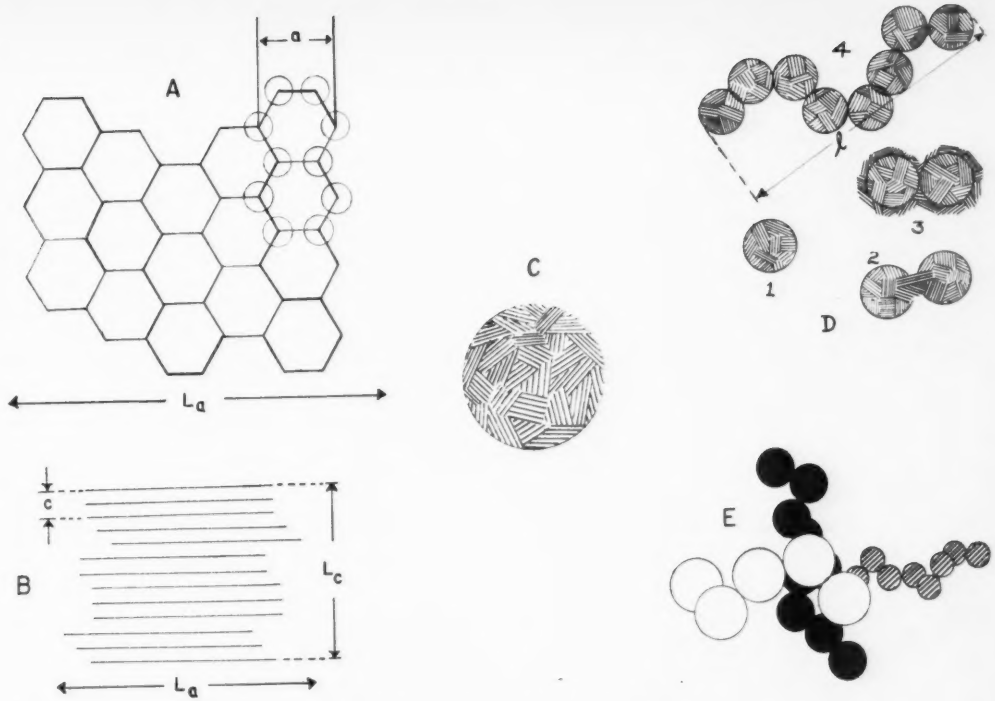


FIG. 1—Schematic drawings of carbon black structure.

(A) Ultimate graphite layer (top view), circles represent carbon atoms; (B) Carbon crystallite (side view); (C) Ellipsoidal unit (cross section); (D) Particles or stable aggregates: (1) a single unit particle, (2) a two-unit particle joined by a common crystallite, (3) a two-unit particle joined rigidly by carbon deposited externally, (4) a many-unit particle; (E) Agglomerates, open circles belong to one particle, solid and shaded to others respectively.

to being spheres, the term "ellipsoidal" is used as more accurately descriptive *(10)*. As a matter of fact, most of the carbon black units are not spheres and the majority give projected images which are quite elliptic. The ratio of major to minor axes of Continex FF, for example, has an average value of 1.26. Other deviations from the spherical are also noted; for example, in lampblack the units seem to be almost cylindrical *(12)*. (A possible explanation for cylindrical shape is that two or more originally spherical nuclei which join together early in the carbon deposition process grow by additional condensation into a single elongated unit.)

4. *Particles or Stable Aggregates:* If the word "particle" is defined as "the smallest separately distinguishable subdivision of a material which remains intact under the forces normally encountered by the material," evidence will be presented that the particles of a carbon black are usually aggregates of ellipsoidal units arranged in rigid chains. For some carbon blacks, such as the thermal blacks, the particles may be identical with the ellipsoidal units or they may be doublets, such as particles (2) and (3) in Figure 1D, but most blacks appear to be composed of chains of more than two units, such as particle (4) in Figure 1D. Where such chain-like particles occur, the blacks behave in rubber to a first approximation as if they consisted of cylindrical rods rather than separate spheroids or ellipsoids.

The present study indicates that the average shape factor of such particles is a property of the black itself rather than a function of the method of mounting or, within limits, the degree of dispersion in the sample preparations. Close observation indicates that the units composing individual particles are of similar diameters, although the diameters of units in separate chains may vary by as much as tenfold or more. Moreover, the average shape factor as measured by the electron microscope is in agreement with the results of experiments in rubber within the limits of uncertainty of both determinations *(2, 3, 4)*.

The shape factor of carbon particles can be changed by very vigorous treatment. Prolonged ball milling *(13)*, heating to a high graphitizing temperature, and drastic treatment with an oxidizing agent, such as sodium hypochlorite, may break up the particles into smaller and more symmetrical groupings of ellipsoidal units. The effect to be expected from milling is fairly obvious but is only achieved after considerable and drastic effort. Heat treatment causes loss of hydrogen, growth in crystallite size, and a progression toward the graphitic state, all of which might be expected to cause embrittlement and weakening of the rigid aggregates. The effects of oxidation have not been studied sufficiently to give an understanding of the mechanism involved, but it is conceivable that oxidative erosion occurs at the comparatively narrow contact points of the ellipsoidal units, allowing separation to occur more readily.

Rubber tests on blacks subjected to any of the above treatments show in all cases substantially lower modulus

than for the untreated black. This reduction in modulus may be due in large measure to the lower shape factor of the treated material, although other factors certainly enter. For example, in the case of oxidation with sodium hypochlorite the treated black may affect the vulcanization reaction and the reduction in modulus may be due at least partly to changes in the elastic matrix of the vulcanized compound.

The nature of the forces which bind the ellipsoidal units into particles is not yet definitely known. In Figure 1D, particle (2) is represented as composed of two units which are held together by crystallites, which extend from one unit into another. Particle (3) represents the structure that might be expected if two units were to cohere in the flame and additional carbon were later to deposit over the entire doublet and cement the units together. In addition to such quasi-chemical methods of binding, Van der Waals and electrical forces may also be involved. The marked stability of elongated particles appears to favor the quasi-chemical forces, while the absence of sharp cusps (even at 50 angstrom resolution) at the juncture between most of the units in the chain-like particles, and the uniformity of unit diameters in individual particles, are added evidence for the binding structure illustrated by particle (3).

The predominance of chain-like over cluster aggregation in electron micrographs is noted in most carbon blacks, other than the thermal blacks, and may be associated with electrical charges on the ellipsoidal units first formed in the flame. Some of these units are positively charged *(14)*, and on approaching other particles could induce charges as shown in Figure 2A. If Van der Waals or other forces are sufficiently strong to overcome the electrical repulsion set up when two units collide, they will remain attached to each other. When this charged doublet approaches other units, the latter may be added to the chain as in Figure 2B. Because opposite charges will tend to separate as far as possible, collisions and adherence at the chain ends will be favored and chain-like particles rather than symmetrical clusters will be formed. Inasmuch as ellipsoidal units shortly after their formation are likely to be in a state in which they can stick together more readily than later in their life history when dehydrogenation and crystallization are further advanced, one would expect units formed at the same time in the flame to join together into particles. Since units formed at the same time and place are likely to be of similar diameter, the foregoing mechanism offers a plausible explanation for the uniformity of unit diameters within a given particle, which is so strikingly illustrated in electron micrographs, such as Figures 5, 6 and 7.

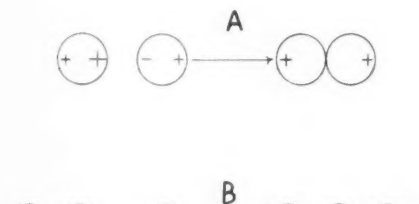


FIG. 2—Schematic drawings of a possible mechanism for chain-like particle formation.

(A) Charged particle attracting neutral particle with induced charge; (B) Charged doublet and neutral particle with induced charge; collision tends to occur at end of doublet.

5. *Agglomerates:* In electron micrographs, particularly where the sample is not well-dispersed or is dense, and in rubber also, except at very low loading, the particles of Figure 1D would be expected to form loose agglomerates, as illustrated by Figure 1E. The individual particles in many agglomerates can be distinguished by remembering that units of uniform size tend to coexist in individual particles. Another method for distinguishing loose agglomerates from particles is being worked out, using the methods of shadow-casting *(10a)*. With a sufficiently sparse carbon deposition on the specimen film one can reduce the presence of agglomerates to a minimum, and under these conditions the results reported in this paper show that shape factor values from electron microscopy agree with the shape factor from rubber compounding experiments. In vulcanized rubber loose agglomerates are probably broken up on stretching the rubber, since they do not seem to affect modulus at normally measured elongations. At very low elongations in vulcanized rubber and in the case of plasticity of unvulcanized rubber, the extent of agglomeration may be important *(2)*.

In the above discussion, only the carbon skeleton of carbon black has been considered. Hydrogen, oxygen, sulfur and hydrocarbonaceous materials may also be present in appreciable amounts sufficient to influence the behavior of the black. Hydrogen appears to be present in the interior as well as on the surface of the ellipsoidal units *(12, 15)*, and may be located along the edges and on the surfaces of the crystallites *(16)*. The amount of hydrogen appears to be related to the crystallite size, decreasing as the crystallites grow. When a sample of black is heated, the crystallites grow slowly until about 1000° is reached, at which temperature the hydrogen is lost rapidly, and the crystallite size increases much more quickly *(5)*. Oxygen and sulfur appear to be located on the surface of the ellipsoidal units. The former has a very marked effect upon rate of vulcanization, water absorption, DPG adsorption and pH, and may exist in several types of adsorption complex *(12, 17, 18)*. On the basis of evidence obtained so far, sulfur content appears to be relatively unimportant.

Particle Shape

Aside from a qualitative attempt at the classification of blacks into those having high, normal, or low "structure" *(19)*, a few rough estimates of shape factor *(3)* and some reference to measurements of chain diameter *(24)*, no information on the shape of particles has been available despite the fact that this factor appears to have an important effect on rubber properties, such as modulus, hardness, and plasticity, and also on the viscosity, thixotropy, and similar properties of paints *(2, 3, 4, 20)*. The current work was undertaken in order to obtain quantitative values for shape factor by means of the electron microscope. Such direct measurements when correlated with behavior of the pigment in rubber should help in giving further insight into the interaction between pigments and elastomers.

Various investigators *(21, 22, 23)* have shown that the modulus, M, of an elastomer containing symmetrical, inelastic particles can be expressed as

$$M = M_o\ (1 + 2.5\ V + 14.1\ V^2) \qquad (1)$$

where M_o is the modulus that the elastic matrix would have in the absence of the pigment particles, and V is the volume concentration of the pigment. For rod-like particles

$$M = M_o\ (1 + 0.67\ fV + 1.62\ f^2V^2) \qquad (2)$$

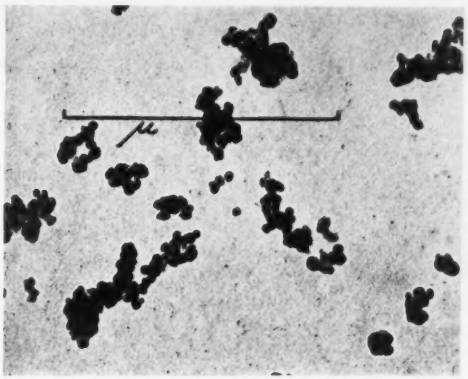


FIG. 3 — Electron micrograph of Continental A (X50,000).

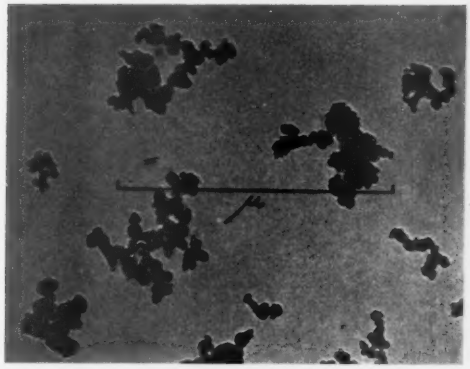


FIG. 4 — Electron micrograph of Continental AA (X50,000).

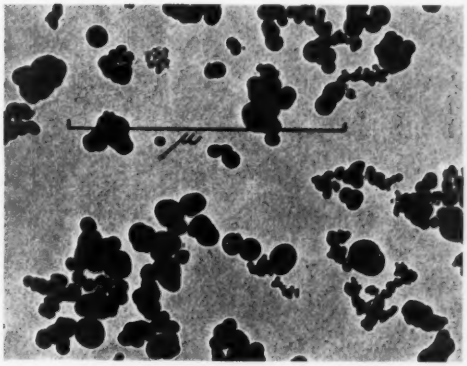


FIG. 5 — Electron micrograph of Continex FF (X50,000).

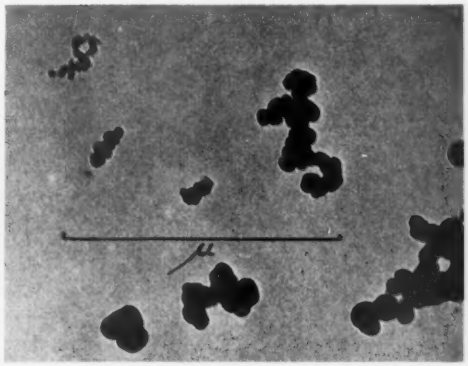


FIG. 6 — Electron micrograph of Continex HMF (X50,000).

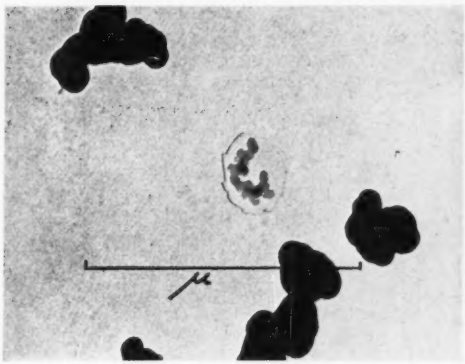


FIG. 7—Electron micrograph of Continex SRF (X50,000).

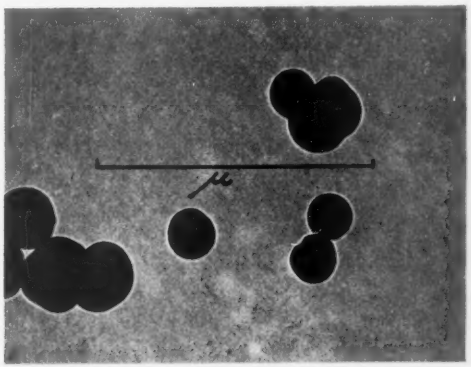


FIG. 8 — Electron micrograph of P-33 (X50,000).

TABLE II—SHAPE FACTOR MEASUREMENTS

Black Sample	Method of Preparing Electron Microscope Sample	Number of Fields Studied	n	N	$\bar{l}$ (A.U.)	$\bar{d}$ (A.U.)	F_1	F'_1
Continental A	Tesla arc	1	458	24	1290	305	4.2	4.2
	Tesla arc	3	681	54	1370	295	4.6	4.6
	Tesla arc	3	956	66	1360	290	4.6	4.7
	Composite of the seven fields	7	2095	144	1350	300	4.5	4.5
Continental AA	Blown dry from an atomizer	1	737	49	1980	300	6.5	6.6
	Blown dry from an atomizer	1	856	63	1950	370	5.4	5.3
	Tesla arc: the arc did not touch the holder, light deposit	1	1199	55	3300	410	8.1	8.1
	Tesla arc: arc reached the holder, heavy deposit	1	1419	132	1705	365	4.8	4.7
	Composite of the above four preparations	4	4211	299	2230	360	6.2	6.2
Continex FF	Dry atomization	1	772	85	2000	495	4.5	4.1
	Dry atomization	1	625	71	2270	505	4.8	4.5
	Dry atomization	1	734	70	2430	480	4.5	5.1
	Dry atomization	2	708	79	1940	440	4.2	4.4
	Composite of above five preparations	5	2839	305	2160	480	4.6	4.5
Continex HMF	Dry atomization	5	464	50	2825	700	4.1	4.0
	Dry atomization	5	409	60	2565	660	3.8	3.9
	Dry atomization	5	469	60	2755	625	4.1	4.4
	Dry atomization	5	570	53	2825	635	4.8	4.5
	Composite of above 20 preparations	20	1912	233	2740	660	4.2	4.2
Continex SRF	Dry atomization	4	631	81	4030	1130	3.9	3.6
	Dry atomization	3	596	82	3920	1110	3.9	3.5
	Dry atomization	4	651	80	5220	1260	4.3	4.1
	Dry atomization	4	658	79	4560	1170	4.2	3.9
	Composite of above 15 preparations	15	2536	322	4430	1170	4.1	3.8
P-33	Dry atomization	1	130	72	2675	1830	1.4	1.5
	Dry atomization	1	116	68	2535	1700	1.4	1.4
	Dry atomization	1	131	77	2680	1800	1.4	1.5
	Dry atomization	1	96	46	2830	1790	1.5	1.6
	Dry atomization	1	103	55	2445	1810	1.5	1.4
	Dry atomization	1	87	38	2115	1790	1.5	1.2
	Composite of above six preparations	6	663	356	2570	1790	1.5	1.4

where f is the shape factor, that is, the ratio of the length to the diameter of the rod. The problem is to find what measurements can be made with the electron microscope which correspond closely enough to f in equation (2) so that a valid comparison can be made.

Electron micrographs of the blacks in Figures 3 through 8 show that the particles are not simple rods. Except for the thermal blacks, all blacks are composed of zig-zag chains of varying length, often with one or more branches. The shape factor obtained from rubber modulus data is that of a cylindrical rod which would give the same elastic constants as the irregular particles actually present. For a range of concentrations this determination of an equivalent shape factor can be accomplished only approximately. Nevertheless, it is this equivalent shape factor for which we wish to find an approximate value from the electron micrographs. The minimum value, F_1, which can logically be assigned to the shape factor is the maximum linear dimension of a particle as seen in the micrographs (measured as the crow flies, not along the chain), divided by the average width of the chains. Since in most cases clearly distinguishable separate chains appear to be only one ellipsoidal unit in width, F_1 may be defined as l in Figure 1D, divided by the mean diameter, d_e, of the ellipsoidal units in the particle.

On the other hand, the maximum value, F_2, for the equivalent shape factor of the particle would seem to be the actual length of the particle, L, divided by d_e. We arbitrarily define F, the electron microscope measured shape factor, as the average of F_1 and F_2.

TABLE III—SHAPE FACTOR OF CONTINEX HMF

Method of Preparing Electron Microscope Samples	Magnification	Number of Fields Studied	n	N	$\bar{l}$	$\bar{d}$	F_1	F'_1
wet mulling	34,500	2	572	88	3870	840	4.52	4.6
dry atomizing	200,000	20	1912	233	2740	660	4.2	4.2

Measurement of the Shape Factor

Preparation of the Samples and Reproducibility of Results: It is obvious that if in the dispersing and mounting technique the loose agglomerates are not separated, the value of the shape factor might be changed. For comparison, we have used three mounting techniques and from each have attempted to secure sparse fields in which the tendency towards agglomeration would be minimized. These three techniques are: (1) wet mulling the black in collodion, (2) dusting the dry black upon a mounting film and dispersing it with an electric arc, and (3) atomizing the dry black upon a prepared Formvar film. Although the statistical constants of the distribution of ellipsoidal units are the same, as would be expected, for all three methods, the value of both l and the shape factor, F, are slightly higher from either a wet-mulled or a dry-arced than from an air-atomized preparation.

It is probable that mulling may ball up the chain-like particles and actually produce agglomerates. In any case it appears from the results that the forces exerted either by mulling or by a dispersing arc are not as efficient in separating agglomerates as are the forces

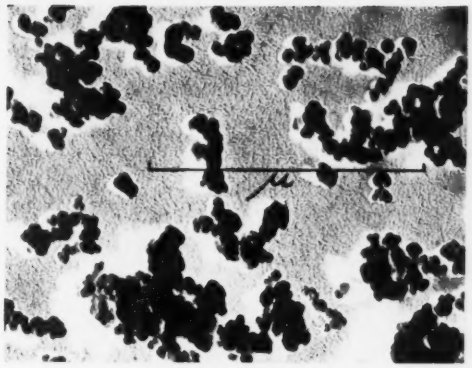


FIG. 9—Electron micrograph of chromium shadowcast of Continental A (X50,000).

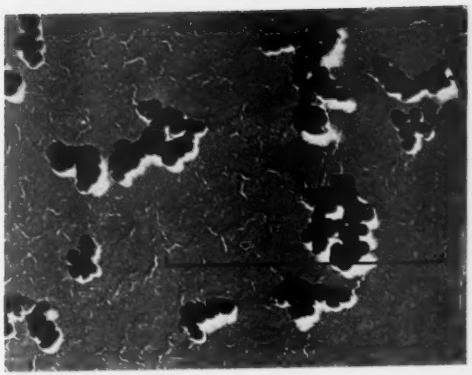


FIG. 10—Electron micrograph of chromium shadowcast of Continental AA (X50,000).

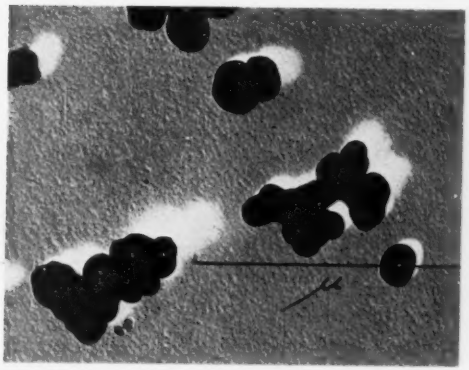


FIG. 11—Electron micrograph of chromium shadowcast of Continex SRF (X50,000).

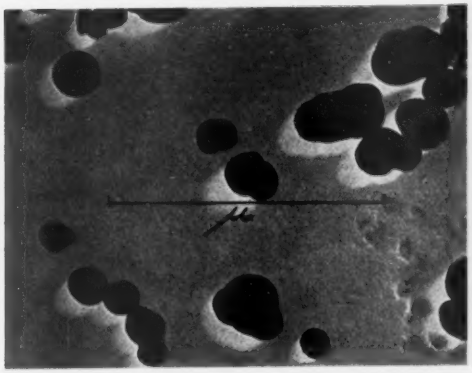


FIG. 12—Electron micrograph of chromium shadowcast of P-33 (X50,000).

brought into play by an atomizing air stream. It should be emphasized that the forces by any of these methods are less than those necessary to break up the particles themselves. Mulling methods have the additional drawback that the particles are encased in Formvar or collodion, and resolution and contrast tend to be lowered accordingly. For these reasons the air atomization method was used in most of this work.

The foregoing discussion is based on experience with six types of carbon black, ranging in mean ellipsoidal unit size from 250 to about 2,000 A.U. Typical pictures of these blacks are in Figures 3 through 8. Recent experiments on still finer blacks indicate that for particles of diameter less than about 200 A.U., the air atomizers which have been used do not break up the agglomerates sufficiently, and shape factors tend to be abnormally high. Another difficulty enters with the smaller blacks since their uniformity is greater and one particle cannot be distinguished from another as readily. The air atomization succeeds best in all ranges when the dispersions are sparse. This is particularly true with the larger blacks, such as P-33 and Thermax where there are many singlets.

Although slightly higher shape factors were obtained by wet mulling than by air atomization, the two values, as indicated by the results in Table III, agree within 8%. Likewise, in Table II the arc method gives about 7% higher average F_1 for Continental AA than air atomization, but this difference is again small. The agreement between the values for the shape factor obtained from different samples of the same carbon black by the air atomization method is, as indicated in Table II, quite good for blacks of widely different particle shape despite the fact that different airflow velocities, sample distance, etc., were used for each sample. All of these facts indicate that shape factor is a characteristic property of a carbon black and, provided reasonable precaution is taken to separate agglomerates, the results obtained by different methods are not seriously different. This conclusion is supported by independent experiments *(10)* in which it was found that the mean length, l, of particles of Shawinigan acetylene black (made according to a U. S. patent application now pending) was a characteristic property. If l is characteristic of a black, one would expect the shape factor, F_1, to be characteristic, because F_1 is approximately equal to $1/d$ (F_1') as indicated in Tables II and VI.

General Procedure: In all of the electron microscope

TABLE IV—DISTRIBUTION DATA FOR $\frac{l}{\bar{d}_e}$ VALUES

$\frac{l}{\bar{d}_e}$ Ranges	Frequencies					
	Continental A	Continental AA	Continex FF	Continex HMF	Continex SRF	P-33
1.0	—	4	4	7	3	194
1.5	—	—	19	5	10	51
2.0	6	25	30	14	40	58
2.5	6	—	41	21	41	17
3.0	9	51	32	31	44	22
3.5	9	—	20	21	31	8
4.0	10	49	22	28	23	2
4.5	14	—	17	26	15	4
5.0	16	53	28	11	23	—
5.5	8	—	16	10	17	—
6.0	10	27	15	18	15	—
6.5	9	—	11	11	8	—
7.0	7	19	14	9	14	—
7.5	8	—	8	6	9	—
8.0	7	14	5	4	7	—
8.5	3	—	7	1	6	—
9.0	9	12	5	4	3	—
9.5	4	—	3	3	4	—
10.0	4	10	1	—	1	—
15.0	5	21	7	2	6	—
20.0	—	10	—	—	2	—
25.0	—	3	—	—	—	—
30.0	—	—	—	—	—	—
35.0	—	1	—	—	—	—
Total Particles, N	144	299	305	232	322	356

work micrographs were taken at about 13,000 diameters, with a biased source. Original plates were projected on a screen for study at X200,000 and the units were classed in 50 A.U. ranges, except for the coarser samples, where a slightly reduced original magnification and a projected enlargement of X100,000 was used, with ranges of 100 A.U. Micrographs and measurements were made in accordance with previously published techniques *(24)*.

In given fields all particles and as many units as were visible in each particle were counted. Data for each particle were kept separately and shape factors calculated for each from the values of l and $\bar{d}_e$. These individual shape factors were averaged to give F_1. All of the data for d were used to calculate the arithmetic and geometric means and the deviations. Choice of a field was governed only by the necessity for picking sparse fields. Otherwise, the material was micrographed at random.

Magnifications were calibrated frequently, using fresh replicas of a diffraction grating, and no appreciable variations occurred. Shadow-casting was done with chromium vapor at an angle of approximately 52°. Four examples of shadow-cast carbon blacks are given in Figures 9 to 12. For each shadow-cast particle measured, the maximum shadow length, h, was also determined.

Measurement of Particle Length: The maximum dimension, l, across a chain-like particle is, except for a straight rod lying in the plane of the micrograph, less than the true length obtained by measuring in a zig-zag fashion along the chain. The ratio of L_p, the length of the projected image of a particle measured along the chain, to l may be considered as a correction factor for the deviation of the chain from linearity in the plane of the micrograph. This correction may be estimated by measuring L_p and l for a statistically significant number of particles, calculating the ratio $\frac{L_p}{l}$ for each particle and obtaining α_1, the arithmetic mean of the $\frac{L_p}{l}$ values.

On the average, the deviation from linearity in the plane of the micrograph should be equal to the deviation from linearity in a plane perpendicular to that of the micrograph, particularly for the finer particles where the effect of gravity is negligible. Without attempting a rigorous analysis, one might assume that F_1 should be multiplied by α_1^2 to correct for non-linearity both in the plane and perpendicular to it. The accuracy of this assumption has been checked by comparing α_1 for a given black with α_2 where α_2 is the correction to F_1 for the foreshortening of the projected length owing to the fact that the chains do not, in general, lie flat but are oriented at an angle to the plane of the supporting film (see note below). As shown in Table V, α_1 and α_2 agree within 10%.

Correction for Ellipticity: Since only the maximum diameters of the ellipsoidal units are measured, and since the units are joined at random in the particles as far as orientation of the major to minor axes of neighboring units is concerned, a correction should be applied to F to account for the ellipticity. This correction would tend to increase the value of F. The ellipticity correction, e, is determined by measuring major and minor axes, d and b, respectively, for a statistically significant number of units and calculating the average of $(d + b)/2b$. Thus,

$$e = \frac{\bar{d} + \bar{b}}{2\bar{b}} \qquad (4)$$

Correction for Agglomeration: The previously cited criteria which enable one to distinguish individual particles, plus the care which is exercised to reduce agglomeration, tend to minimize this factor and no correction

Note: To avoid a calculation more complicated than warranted by the results, α_2 was taken as

$$\alpha_2 = \left[1 + \frac{4\bar{h}^2}{\bar{l}^2} \right]^{1/2} \qquad (3)$$

where $\bar{h}$ is the average of the heights, h, of a statistically significant number of individual particles. Each h is obtained from the measured value of the maximum shadow length, h_s, and the shadowing angle, θ. From Figure 13 it is seen that for a V-shaped particle oriented base downward and perpendicular to the film, α_2 is the ratio of the true particle length to the projected length, l, provided the ellipsoidal units are small compared to l. Despite this and other assumptions Equation 3 seems to be a useful first approximation for α_2.

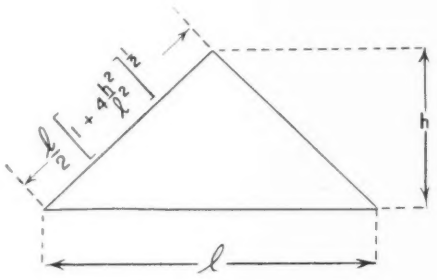


FIG. 13—Schematic drawing to illustrate calculation of α_2.

has been used in the calculations. Any correction that might be applied would, of course, decrease F.

Measurement of Average Ellipsoidal Diameter: The unit diameter d is obtained from negative micrographs projected on a screen at X200,000. Several plates and consequently many fields and usually more than one preparation contribute to the composite results for a sample. The results per plate are reported separately in Table II, so that an idea of the reproducibility can be secured, and also that some conception be gained of how many units should be counted and measured to give accurate results.

If the distribution is sufficiently and properly skewed and if a good straight line is obtained on plotting the results on logarithmic probability paper, the geometric mean read from the graph may be taken as the mean diameter of the units *(24)*. If the distribution is symmetrical and the graph departs markedly from a straight line, the arithmetic mean or average $\bar{d}$ is calculated from:

$$\bar{d} = \frac{1}{n} \sum_{i} n_i d_i \qquad (5)$$

where n is the total number of diameters measured, n_i is the number in the ith class and d_i is the center of the ith class. Figure 14 is typical of the graphs used in determining d. The center of the particular size range is plotted against "percentage less than stated size."

For the shape factor calculations the d's for as many units as are visible in a particular chain are measured and their arithmetic mean, $\bar{d}_c$, calculated and divided into the l for that chain. These quotients are then averaged to give the uncorrected or minimum shape factor, F_1. The use of the arithmetic mean, $\bar{d}_c$, to calculate the shape factor, simplifies the calculations and is further justified because the d values for the particles of any one chain are usually quite uniform. Shape factor distributions obtained for various blacks are given in Table IV.

Some formal definition of the diameter, d, must be rigorously applied in measurement. The longest diameter has been chosen because it can be measured from the micrographs more quickly and more accurately than the minimum or the mean diameter. This diameter can be quite easily corrected to either of the other two if occasion demands. Shadow micrographs such as Figures 9 to 12 indicate that the ellipsoidal unit dimension perpendicular to the supporting film is the same order of magnitude as the two dimensions parallel to the plane of the film.

By multiplying F_1 by the ellipticity correction, e, the shape factor based on the average ellipsoidal diameter rather than the maximum diameter is obtained. The values for F_1 in the tables do not include this correction, but, as indicated below in Equation 6, the values for F_2 include the ellipticity correction.

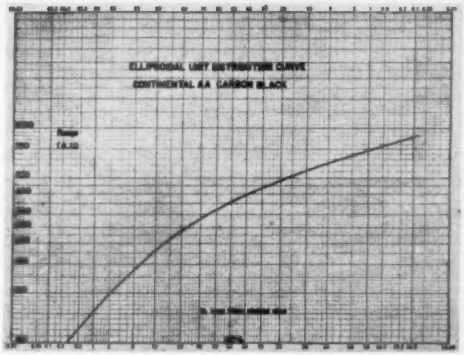


FIG. 14—Diameter distribution of ellipsoidal units of Continental AA plotted on logarithmic probability paper.

In Table V values of the correction factors are given for the six blacks which were studied. In all cases the ratio of d/b is appreciably greater than unity. The ellipticity correction has not been calculated for P-33 because the great majority of the particles are singlets in which case the shape factor has been taken as the maximum diameter divided by the minimum so that no correction is required.

Calculation of the Shape Factor: The significance of F_1 as the minimum value of the shape factor has already been discussed. F_2, the maximum value of the factor, may be defined as:

$$F_2 = \frac{e a_1 a_2}{N} \sum_{N} l/d_c \qquad (6)$$

or

$$F_2 = e a_1 a_2 F_1 \qquad (7)$$

where

$$F_1 = \frac{1}{N} \sum_{N} l/d_c$$

A short cut which appears to be satisfactory is the use of F_1' for F_1 where

$$F_1' = \bar{l}/\bar{d} = \frac{1/N \Sigma l}{1/n \Sigma d} \qquad (8)$$

In Tables II and VI, F_1, determined from Equation 7 and F_1' from Equation 8 agree closely.

TABLE V—ELLIPSOIDAL UNIT MEASUREMENTS ($\bar{d}$, $\bar{b}$, e) AND CORRECTION FACTORS FOR CHAIN LENGTH (a_1, a_2)

Black Sample	$\bar{d}$ (A.U.)	d/b	e	$\bar{b}$ (A.U.)	a_1	a_2
Continental A	300	1.26	1.13	600	—	1.24
Continental AA ...	360	1.21	1.11	475	—	1.10
Continex FF	480	1.26	1.13	860	1.27	1.28
Continex HMF ...	660	1.16	1.08	1180	1.46	1.32
Continex SRF	1170	1.07	1.04	2330	—	1.45
P-33	1790	1.16	—	1250	—	—

TABLE VI—SHAPE FACTORS FOR VARIOUS BLACKS

Sample	F_1	F_1'	F_2	F	f *
Continental A	4.5	4.5	7.3	5.9	—
Continental AA	6.2	6.2	8.1	7.2	6.0
Continex FF	4.6	4.5	7.7	6.2	6.0
Continex HMF	4.2	4.2	7.8	6.0	6.0
Continex SRF	4.1	3.8	7.9	6.0	5.5
P-33	1.5	1.4	1.5	1.5	1.0

* Used in previous publications *(2, 3, 4)* to obtain agreement with experimental rubber modulus and hardness values.

Table VI also gives the values of F_2 for each black. All of the applied corrections increase the value of the shape factor. On the other hand, the measured I is likely to be slightly greater than it should be on account of residual agglomeration, which would lower the value of the shape factor if a correction were made. The true value will probably lie between F_1 and F_2, and for this reason F, the average of F_1 and F_2, has been chosen as the best value for comparison with rubber data.

Comparison of Shape Factor with Rubber Results: Also included in Table VI is the shape factor, f, used in previous work *(2-4)* for fitting the theoretical equations for modulus *(20)* and hardness *(4)* to experimental values. More recently the values of the shape factor which would give the least mean square deviation from the theoretical equations for a range of pigment loadings has been determined. These values of f for various blacks, or rather the average of the separate values obtained from modulus and hardness, are given in Table VII. The carbon blacks used in these rubber tests were from the same bag from which the electron microscope samples were taken.

In general, the values of f determined from rubber modulus at elongations of 300 to 400% are higher than the F obtained from electron micrographs, while the f's from hardness measurements, using the semi-empirical logarithmic hardness equation *(4)*, are lower. The difference in the two types of rubber measurements may be as much as 100% or more, so that the data in Table VI should be considered merely as showing a rough correlation between f and F.

Ellipsoidal Unit Size and Specific Surface Area

In earlier investigations *(24-28)* specific surface area of typical carbon blacks has been calculated from the ellipsoidal unit diameter distributions, usually referred to in previous publications as the "particle size" distribution.

If it is assumed that the ellipsoidal units are spheres of uniform diameter and that the area which is not accessible as a result of unit-to-unit contact is negligible, then:

Specific surface area in square meters per gram =

$$S'' = 6 \times 10^4 / \rho \, \overline{d} \qquad (9)$$

where ρ = density of the units in grams per cc,

$\overline{d}$ = diameter in Angstrom units, and

S'' = specific area for uniform spherical units.

If the units are not of uniform diameter, then

$$S' = 6 \times 10^4 \, \overline{d^2} / \rho \, \overline{d^3} \qquad (10)$$

where $\overline{d^2}$ = the arithmetic mean of the square of the unit diameters,

$\overline{d^3}$ = the mean of the cube of the unit diameters, and

S' = specific area for spherical units.

In general for units of any size and shape

$$S = \frac{10^4 \times \text{average area per unit}}{\rho \times \text{average volume per unit}} \qquad (11)$$

If the shape, while not spherical, is assumed to be the same for all particles, for example the particles may be ellipsoids of constant eccentricity, then

$$S = k \, v \, S' \qquad (12)$$

where, as previously pointed out *(9)*

$$k = \frac{\text{surface area of an actual particle, one of whose dimensions is d}}{\text{surface area of a sphere of diameter d}}$$

$$v = \frac{\text{volume of a sphere of diameter d}}{\text{volume of an actual particle, one of whose dimensions is d}}$$

In Table VIII, S'' has been calculated from Equation 9 and S' from Equation 10, using the maximum ellipsoidal unit diameter in calculating $\overline{d^2}$ and $\overline{d^3}$ and taking $\rho = 1.8$. Equation 12 was used for S. The correction factors k and v were obtained from the electron micrographs, assuming that the units are prolate spheroids formed by rotation of an ellipse about its major axis and that the major axis is in the plane of the micrograph.

The high magnification at which this work was done (X200,000), the superior definition of the plates, and the large number of units which were measured have made it possible to determine the specific surfaces with high accuracy and excellent reproducibility.*

The areas from the electron micrographs agree fairly well with the areas determined by low temperature nitrogen and iodine adsorption measurements on the same blacks (Table VIII). The higher areas obtained by adsorption for the two channel blacks may indicate that a surface roughness factor should be applied for these blacks.

Summary and Discussion

In order to obtain a clear picture of the physical structure of carbon black, a terminology slightly different than used in the previous literature has been suggested. The term "particle" is confined to the chain-like aggregates which appear to survive intact through most of the commercial handling and applications of the material. The spheroidal or ellipsoidal units which compose these particles or chain-like aggregates are referred to as units rather than "particles" as in earlier publications.

TABLE VII—ELECTRON MICROSCOPE SHAPE FACTORS COMPARED WITH SHAPE FACTORS CALCULATED FROM RUBBER EXPERIMENTS

Black	Elastomer	f	F
Continental A	Smoked Sheet	6.5	5.9
Continental AA	Smoked Sheet	7.8	7.2
Continental AA	GR-M	8.8	7.2
Continental AA	Hycar	7.5	7.2
Continental AA	GR-S	7.3	7.2
Continex FF	GR-S	5.5	6.2
Continex SRF	GR-M	6.1	6.0
P-33	GR-S	>1.0*	1.5

* Modulus is slightly higher than predicted by Equation 1 indicating some asymmetry. Equation 2 cannot be applied for f in the range 1 to 4 so that a more accurate estimate cannot be given until an equation for short rods is derived.

* A further correction could be made for the area eliminated by contacts between units. For spheroidal units

$$S = \frac{6 \times 10^4 \, \overline{d^2}}{\rho \, \overline{d^3}} \cdot \frac{[1 - 2(F_2 - 1)\beta]}{4 \pi F_2} \qquad (13)$$

where β is the angle subtended by the contact area of two adjacent units and F_2 is the average number of units in the chain-like particles, which is equal to the maximum shape factor, F_2, as previously defined, provided the chains are only one unit thick. Equation 13 is only rigorous where the ratio of the contact area to the total area of a unit is independent of the unit diameter.

TABLE VIII—SPECIFIC SURFACE AREA (SQUARE METERS/GM)

Sample Black	$\bar{d}$ (A.U.)	k	v	k - v	S'*	S'**	S † (electron micrograph)	S (N_2 ads.)	S (I_2 ads.††)
Continental A	300	0.73	1.59	1.16	89	103	120	127	138
Continental AA	360	0.78	1.46	1.14	70	80	91	131	133
Continex FF	480	0.73	1.59	1.16	44	51	59	39	37
Continex HMF	660	0.83	1.35	1.12	36	40	45	—	30
Continex SRF	1170	0.90	1.15	1.04	23	24	25	23	23
P-33	1790	0.83	1.35	1.12	19	21	24	—	—

* Calculated from Equation 9. ** Calculated from Equation 10. † Calculated from Equation 12. †† Relative values based on the area of Continex SRF equal to 23 square meters/gm.

The evidence from the current work supports the view that the chain-like particles are formed in the flame and consist of ellipsoidal units which are firmly attached to each other. A mechanism of formation of the particles in the flame is suggested in order to explain the predominance of chain-like rather than more symmetrical aggregates of units.

Electron microscopically measured shape factors have been compared with the factors obtained from rubber modulus and hardness measurement. It is certainly true that the thermal blacks, such as P-33, which have strikingly low modulus and hardness also have very low shape factor. However, among the semi-reinforcing and reinforcing furnace and the channel blacks, although a rough correlation appears to exist between the measured shape factors and those calculated from rubber tests, the differences are too small to decide on the significance of the results at present.

Difficulties in making the microscope measurements have been discussed and correction factors that can be used are pointed out.

Some of the uncertainties in the application of the theoretical modulus and hardness equations have been previously considered *(2-4)*. The question of the effect of the carbon black on the rubber matrix itself is worth re-emphasizing. Different blacks and different amounts of the same black may alter to a varying extent the gelation and cross-linking or the degradation of the elastomer during mixing and vulcanization. As a result, the matrix properties of the vulcanizate may differ not only from pigment to pigment but also from one loading to another.

While these difficulties prevent accurate quantitative determination of shape factor from rubber tests at the present time, the range in which the shape factor should fall can be estimated. This range is in agreement with the electron microscope shape factors measured in this paper.

Specific surface areas have been calculated from the ellipsoidal unit size distribution obtained from electron micrographs. Higher magnifications and correction for ellipticity has permitted greater accuracy than previously possible. Nevertheless, agreement with low temperature nitrogen and iodine adsorption areas is only within 25 to 50% for most of the blacks. In the case of the channel blacks the higher area values obtained by adsorption can be explained by the assumption of a surface roughness factor but it is more difficult to account for the fact that the adsorption areas are lower than the electromicrograph areas for the furnace blacks.

The present work furnishes unit size distribution, surface area, and particle shape measurements for a series of representative commercial carbon blacks. Extension of these studies to other blacks such as acetylene, MAF (medium abrasion furnace) and HAF (high abrasion furnace), to inorganic pigments, and to these materials deliberately treated in various ways in order to alter the particle shape or surface, would throw additional light on the role of these factors in rubber reinforcement.

ACKNOWLEDGMENT

The authors take pleasure in thanking Dr. W. R. Smith of Godfrey L. Cabot, Inc., for obtaining the nitrogen adsorption area measurements, Dr. P. L. Copeland of the Illinois Institute of Technology, who took the electron microscope pictures of Continex HMF, using the wet milling method, and Mr. Herbert Frankel and other members of the Witco Chemical Co. staff who made some of the calculations. The authors also wish to express their thanks for permission to publish this paper to the Witco Chemical Company under whose auspices this work was carried out.

SPECIAL NOTE

Some of the ideas and results expressed in this paper were delivered in lecture form by Dr. Cohan at the Rubber Technology Conference in London, England, in June, 1948, and by Dr. Watson at the Symposium on Light and Electron Microscopy, sponsored by the Armour Research Foundation in Chicago, Illinois, in June, 1948.

LITERATURE REFERENCES

(1) Ladd, W. A., and Wiegand, W. B., *R.A. (N.Y.)*, Vol. 57, p. 299 (1945).
(2) Cohan, L. H., "Proceedings of the Second Rubber Technology Conference: 1948," London, p. 365.
(3) Cohan, L. H., *I.R.W.*, Vol. 117, p. 343 (1947).
(4) Cohan, L. H., and Smith, R. E., *R.A. (N.Y.)*, Vol. 63, p. 465 (1948).
(5) Biscoe, J., and Warren, B. E., *J. App. Phys.*, Vol. 13, p. 364 (1942).
(6) Mrgudich, J. N., and Clock, R. C., *Trans. Electrochem. Soc.*, Vol. 29, p. 329 (1944).
(7) Bernal, J. D., *Proc. Roy. Soc. (London)*, Vol. 106-A, p. 749 (1924).
(8) Watson, J. H. L., *J. App. Phys.*, Vol. 17, p. 121 (1946).
(9) Watson, J. H. L., *Trans. Electrochem. Soc.*, Vol. 92, p. 77 (1947).
(10) Watson, J. H. L., *J. App. Phys.*, Vol. 20, p. 747 (1949).
(10a) Watson, J. H. L., unpublished research.
(11) Anderson, R. B., and Emmett, P. H., *J. App. Phys.*, Vol. 19, p. 367 (1948).
(12) Cohan, L. H., *Chem. Eng. News*, Vol. 23, p. 2078 (1945). (Note Figure 10 in particular.)
(13) Dobbin, R. E., and Rossman, R. P., *Ind. Eng. Chem.*, Vol. 38, p. 1145 (1946).
(14) Columbian Carbon Co., "Columbian Colloidal Carbons," 1938.

(Continued on Following Page)

(15) Snow, C. W., Wallace, D. R., and Sweigart, A. L., Paper presented before the Rubber Division, A.C.S., Cleveland, Ohio, May, 1947.
(16) Balandin, A. A., and Patrikeev, V. V., *Compt. Rend. Acad. Sci. (U.S.S.R.)*, Vol. 40, p. 152 (1943).
(17) Cohan, L. H., chapter on Carbon Black in "Science of Petroleum," Vol. V, Part II, Oxford University Press (to be published).
(18) Smith, W. R., "Proceedings of the Second Rubber Technology Conference: 1948," London, p. 403.
(19) Sweitzer, C. W., and Goodrich, W. C., *R.A. (N.Y.)*, Vol. 55, p. 469 (1944).
(20) Guth, E., *J. App. Phys.*, Vol. 16, pp. 20-25 (1948).
(21) Rehner, J., Jr., *J. App. Phys.*, Vol. 14, p. 638 (1943).
(22) Smallwood, H. M., *J. App. Phys.*, Vol. 15, p. 758 (1944).
(23) Guth, E., and Gold, O., *Phys. Rev.*, Vol. 53, p. 322 (1938).
(24) Watson, J. H. L., *Anal. Chem.*, Vol. 20, p. 576 (1948).
(25) Emmett, P. H., *Ind. Eng. Chem.*, Vol. 37, p. 639 (1945); *J. App. Phys.*, Vol. 19, p. 367 (1948).
(26) Continental Carbon Co., "Compounding Buna with Channel Carbon Black," Buna Report No. 1 (Dec., 1942).
(27) Cohan, L. H., and Mackey, J. F., *R.A. (N.Y.)*, Vol. 55, p. 583 (1944).
(28) Cohan, L. H., *Chem. Eng. News*, Vol. 23, p. 2078 (1945).

Electrofilm Graphite Coating Processes

A MEANS of applying a stable graphite film to practically any surface, allowing for the first time practical use of the desirable characteristics of graphite for a multitude of mechanical and electrical uses, has been developed. Called the Electrofilm Graphite Process, it was developed by the Electrofilm Corporation of North Hollywood, Calif., and is being offered to industry by the Metal Finishing Division, Pyrene Manufacturing Co., Newark 8, N. J. The process has already been subjected to intensive testing in a wide range of aircraft, automotive and industrial applications.

The graphite film applied by the Electrofilm process is extremely thin (0.00015 to 0.0005 in.) but is said to possess excellent resistance to abrasion and great bearing strength. The adhesion of the film to the intended surface is high, and on metal and most other surfaces sufficient diffusion of the graphite into the surface is obtained to insure presence of a graphited surface even when the external coating is apparently removed by severe abrasion. Graphite coating of only one of any pair of surfaces is usually adequate, although occasionally surface treatment of the uncoated part may be desirable to make it more receptive to impregnation by free graphite during break-in.

The graphite film is applied by spray or dip, following normal surface preparation, and has been successfully used on metal, plastics, rubber and ceramics. For most purposes, no plating is required, although the treatment can be applied over plated parts, and plating is sometimes used for electrical or mechanical considerations.

The graphite film is stable and provides the intended surface characteristics over temperature ranging from —120°F. up. Some variations have been tested satisfactorily to 2000°F. The film is unaffected by exposure to solvents or weather. After treatment, the surface is dull dark grey in appearance, but in initial operation the film quickly laps in to a highly burnished surface, while the very slight amount of free graphite in the dull surface is transferred to and lapped into the mating surface. Following initial burnish, no change in the film takes place.

A number of Electrofilm specifications are currently available. One of these, Specification No. 4746, finds special application as an anti-friction coating in areas where contacted by sliding rubber, such as O-rings. It is said to be especially effective for cylinders and all mating parts sliding against any rubber or rubberlike materials.

Service test and initial production coating is usually handled in the Pyrene plant at Newark, although the company is prepared to train personnel and assist in assembling complete facilities for applying the processes in any plant where volume warrants. Licensing arrangements are available, with provision for technical guidance as required. Controlled-quality coating materials are supplied to the licensee from the Pyrene laboratory.

Simple and comparatively inexpensive equipment is required, according to the company, and is of a nature usually found in the average manufacturing plant, including dip tanks, spray booth, plating equipment, and bake oven.

The manufacture of a **super speed air motor** has been announced by the Bellows Co., Akron, Ohio. It is a double-acting air cylinder developing tremendous piston rod speed and power from normal operating air pressure and is said to be ideally suited to a wide range of staking, riveting, swedging, stamping and punching operations.

General Electric Co., Schenectady, N. Y., has announced that the **G-E Electric ACA Motor** (a-c adjustable speed) is now available with a mechanical follow-up control for achieving a fixed preset speed without the use of expensive control equipment. The new device enables a predetermined speed to be set manually by a knob either directly on the ACA motor or at the end of a flexible cable 10 or 15 feet away.

Designed to reduce labor and mixing time to a minimum, a new model direct motor-driven **heavy duty paste mixer** has been introduced by Charles Ross & Son Co., Brooklyn, N.Y. Available in 50, 100 and 150-gallon capacities, the mixers incorporate an automatic cut-off which stops the stirrers from revolving, without damage to the machine, should a bag or foreign matter fall into the mixer.

Ledeen Manufacturing Co., Los Angeles, Calif., has introduced a line of **valves for actuating air or hydraulic cylinders.** The valves embody the rotating disc construction and are made for hand operation, foot operation and finger or solenoid operation. They are available in 14 different models for 5 different cycles in 6 sizes, and may be used for controlling the flow of air, oil or water.

Butyl Acrylate-Acrylonitrile Rubbers Resistant to Heat, Oils and Low Temperatures

By T. J. DIETZ* and J. E. HANSEN

Eastern Regional Research Laboratory, Philadelphia 18, Penna.

SUBSTANTIAL evidence now exists in published data on high polymers which demonstrates that many polymers and copoylmers of alkyl acrylates can be vulcanized by a number of curing recipes *(1-9)*. Outstanding among such polymers and copolymers from the commercial viewpoint are the ethyl acrylate polymer Hycar PA *(5)*, and the ethyl acrylate-chloroethyl vinyl ether copolymer Lactoprene EV *(3, 4, 6, 8)* now being produced with commercial modifications as Hycar PA-21 and Hycar PA-31 *(5)*. When these materials are cured with suitable recipes, vulcanizates are produced which, among other desirable properties, have outstanding resistance to hot petroleum base oils.

Additional Acrylic Polymers

Acrylic vulcanizates, in addition to Hycar PA and Lactoprene EV, which have been described as having superior heat and oil resistance, include copolymers of ethyl acrylate with chloropropyl acrylate *(6)*. The great majority of copolymers reported as vulcanizates were cured with recipes which produced inferior heat resistance. The recipes employed were designed to evaluate tensile properties and curing characteristics rather than to produce compositions having superior heat resistance. Consequently, it should not be assumed that the inferior heat resistance of these compositions was inherent in the copolymers themselves, or that improved heat resistance could not have been obtained with a different curing recipe.

Recent results obtained with copolymers of n-butyl acrylate and acrylonitrile demonstrate that with certain amine curing recipes, vulcanizates can be obtained which compare favorably in heat resistance with similar compounds of Lactoprene EV. The utility of acrylonitrile as a functional part of the polymer chain is apparently not limited to its apparent role in vulcanization. When thus copolymerized with n-butyl acrylate, the acrylonitrile also serves to modify the tensile properties and solubility characteristics of the copolymer without causing excessive brittleness at low temperatures.

To conform with earlier developments of this laboratory in the field of vulcanizable acrylic copolymers, these butyl acrylate-acrylonitrile copolymers, as a class, are designated Lactoprene BN. The designation is followed by a number, as for example Lactoprene BN-10, to indicate the percent of acrylonitrile in the monomer mixture which was used in preparing the copolymer.

Experimental

Copolymers of butyl acrylate and acrylonitrile were prepared by emulsion polymerization under nitrogen at 80° C., using the following recipe:

n-Butyl acrylate	100-x
Acrylonitrile	x
Distilled water	200.0
Emulsifier (Dupanol ME)	2.5
Catalyst ($K_2S_2O_8$)	0.01

The monomers, emulsifier, and water were mixed and brought up to 80° C. The catalyst was then added and polymerization began within a few minutes thereafter. Polymerization was approximately complete within 2 to 3 hours at 80° C. The emulsion was coagulated in a mixture of ethanol, water and hydrochloric acid in a volume ratio of 5:5:1, washed with distilled water three times, and dried in a circulating air oven at 40° C. for 24 to 72 hours or until no appreciable odor of monomer was apparent. Conversions were of the order of 80 percent.

Later results on the polymerization of these copolymers obtained in this laboratory *(10)* have demonstrated that: (1) the use of nitrogen as a polymerization atmosphere is unnecessary above 80° C.; (2) the use of supplementary catalyst added during the course of the polymerization serves to increase the conversion to 95-98 percent without adversely affecting the properties of the resulting copolymer; and (3) other more economical methods for coagulating the latex such as alum precipitation may be used effectively.

The copolymers were compounded, cured and tested in accordance with standard ASTM procedures. In each case, the crude copolymer was masterbatched with the SRF black and the stearic acid in a hot Banbury mixer. The batch was usually mixed for a total time of six minutes at slow speed with the ram down, and was dumped at a temperature approximately 350° F. After the masterbach cooled, it was sheeted on a warm 2-roll mill.

The sulfur and triethylene tetramine were added on the mill. It was observed when milling the 90 butyl acrylate-10 acrylonitrile stock, for example, that the amine could be added slowly and continuously without causing the band to break or to migrate to the back roll. With small amounts of the amine, such as 1 to 2 parts per 100 of copolymer by weight, the compounded stock could be refined by passing through tight rolls at 160 to 170° F. without tending to stick to the rolls or becoming tender. The higher the amount of acrylonitrile in the copolymer, the more readily could the stock be refined.

The 90 butyl acrylate-10 acrylonitrile compounded stock exhibited considerably less shrinkage on the mill than did similar compounds of Lactoprene EV. Further, it appeared smoother and more glossy than the EV compounds. These observations suggest that the butyl acrylate-acrylonitrile compositions may have inherently better processability than ethyl acrylate copolymer compositions. Most of the subject copolymer compositions were cured for 60 minutes at 298° F. for test purposes.

Note: This article was presented at the Fourth Meeting-in-Miniature of the Philadelphia Section of the American Chemical Society in Philadelphia, Penna., on January 18, 1951.

* Present address: Delaware Research and Development Corp., New Castle, Delaware.

Results

Tensile property data obtained on green and heat-aged (350° F. for 72 hours) samples, together with Mooney viscosities of the raw copolymers and brittle points, compression set, and swelling data of the vulcanizates, are shown in Table I. The ratios of butyl acrylate to acrylonitrile indicated at the top of each column are actually the concentrations of the monomers used in the polymerization. Nitrogen analyses from later experiments *(10)* indicate that the copolymers are usually somewhat richer in the ester than the monomer ratio would indicate.

It will be observed that both the brittle point and the curing rate of the copolymers increase with increasing acrylonitrile content. Additional data on differential swelling in organic solvents which substantiate this direct relationship between the state of cure and the acrylonitrile content will be presented in a forthcoming publication. Sulfur was omitted from the 100 percent butyl acrylate control stock because it tends to retard cure. However, its use in the butyl acrylate-acrylonitrile compositions is desirable for superior heat resistance.

The copolymer prepared from a monomer mixture of 87.5 percent butyl acrylate and 12.5 percent acrylonitrile was selected for further study. Its initial hardness and brittle point, together with the effect of aging in hot air and in hot ASTM No. 3 oil on hardness, brittle point, and weight, are shown in Table II. The reader will observe that on the basis of equal loading, the weight increase of the butyl acrylate copolymer in the hot oil was somewhat greater than that of the ethyl acrylate copolymer. However, this moderate swell is within specification requirements for oil resistant gasket rubbers and, in comparison with ethyl acrylate rubbers, possesses the advantage of lower brittle point. Of course, as is well known, the unsaturation of the diene rubber control makes it unsuited for exposure to hot oils containing sulfur.

The swelling of the butyl acrylate copolymer in hot oil could be reduced further, obviously, by increasing the percentage of acrylonitrile in the copolymer, an improvement to be had at sacrifice of low temperature flexibility.

The reader will also note that the butyl acrylate copolymer in Table II was cured at 350° F. while the ethyl acrylate control was cured at 298° F. The butyl acrylate copolymer was cured at the higher temperature in an attempt to improve cure to the point where a "temper" in a hot air oven following cure would be unnecessary for maximum compression set resistance. Had the butyl acrylate stock in the table been cured, as others were, for 60 minutes at 298° F., the properties would not have differed appreciably from those shown.

TABLE I—PROPERTIES OF N-BUTYL ACRYLATE-ACRYLONITRILE COPOLYMERS CONTAINING VARIABLE AMOUNTS OF ACRYLONITRILE

	Copolymer Composition, %				
	100-0	95.5 (BN-5)	90-10 (BN-10)	87.5-12.5 (BN-12.5)	85-15 (BN-15)
Raw Mooney, ML-4, 212° F.	21	25	29	37	44
Recipe					
Copolymer	100	100	100	100	100
Stearic Acid	1	1	1	1	1
Sulfur	—	0.67	0.5	1.0	0.67
Triethylene tetramine[a]	2	1.3	1.0	1.0	1.3
SRF black	50	50	50	50	50
Cure (minutes/° F.)	60/298°	60/298°	60/298°	60/298°	60/298°
Initial Properties					
Tensile strength, psi.	490	810	1360	1400	1590
Ultimate elongation	920	640	250	280	240
Modulus at 100%, psi.	45	150	340	290	470
Durometer, 30 sec.	—	—	55	54	60
Volume change, %, after 48 hrs. at 212° F. in water	—	—	6.0	6.0	—
Volume change, %, after 48 hrs. at 72° F. in iso-octane	—	—	23	18	—
Volume change, %, after 2 weeks at 72° F. in Circo Light Process Oil	—	16	10	8	2
Compression Set, 70 hrs. at 250° F. (ASTM Method B)[b]	—	77[b]	70[b]	66	66[b]
Compression Set,[b] 70 hrs. at 250° F. (ASTM Method B)	—	35[b]	31[b]	—	31[b]
Brittle Point, °F.	—56	—42	—36	—22	—15
Aged Properties, 72 hrs./350° F.					
Tensile strength, psi.	soft	720	1240	1310	1600
Ultimate elongation, %	—	360	140	120	100
Modulus at 100%, psi.	—	50	800	1100	1600
Durometer, 30 sec.	—	—	67	70	79

(a) Recipe, 1 part sulfur and 1 part triethylene tetramine; (b) Samples previously tempered in air for 24 hrs. at 350° F.; (c) ASTM Method of Test, D746-44T, manually operated.

TABLE II—BRITTLE POINT AND HOT OIL RESISTANCE OF A BUTYL ACRYLATE-ACRYLONITRILE COPOLYMER COMPARED WITH AN ETHYL ACRYLATE-CHLOROETHYL VINYL ETHER COPOLYMER AND A BUTADIENE-ACRYLONITRILE COPOLYMER.

Copolymer	Butyl Acrylate Acrylonitrile[a]	Ethyl Acrylate Chloroethyl Vinyl Ether[b]	Butadiene-Acrylonitrile[c]
Composition, %	87.5/12.5	95/5	75/25
Recipe			
Copolymer	100	100	100
Zinc oxide	—	—	5
Stearic acid	1	1	1
SRF black	50	50	75
Sulfur	0.67	1	1.5
Triethylene tetramine	1.3	—	—
Trimene Base	—	4	—
Benzothiazyl disulfide	—	—	1
Cure (minutes/° F.)	30/350°	60/298°	60/287°
Properties, initial			
Durometer, 30 sec.	46	61	65
Brittle point, °F.[d]	—22	+23	—53
Properties, aged in air 68 hrs./300° F.			
Durometer, 30 sec.	54	63	90
Brittle point, °F.[d]	—18	+25	>+70
Change in weight, %	—1.6	—1.7	—1.1
Properties, aged in ASTM No. 3 oil 68 hrs./300° F.			
Durometer, 30 sec.	30	61	27
Brittle point, °F.[d]	—27	+18	—60
Change in weight, %	+27.6	+9.5	+41.6

(a) Lactoprene BN-12.5; (b) Lactoprene EV; (c) A commercial nitrile rubber; (d) Modified ASTM Method of Test, D746-44T, solenoid operated.

Summary

The properties of Lactoprene BN vulcanizates classify them as specialty rubbers rather than general purpose rubbers. Because of their combined resistance to hot oils, dry heat, water, and low temperatures they should provide improved materials for the manufacture of oil seals, coolant seals, O-rings, gaskets and similar mechanical specialties.

ACKNOWLEDGMENT

The authors are indebted to the Delaware Research and Development Corporation for the properties data of Table II; to E. M. Filachione and T. J. Fitzpatrick for reference to unpublished experiments dealing with copolymerization, and to W. E. Palm and H. C. Fromuth for assistance in the experimental work.

(See Page 706 for Literature References)

Symposium on Quality Control by Statistical Methods

Sponsored by the Akron Rubber Group at Its Meeting on February 2, 1951

THE fourth annual Mid-Winter Symposium of the Akron Rubber Group, held at the Hotel Mayflower in Akron, Ohio, on February 2, covered the subject "Quality Control by Statistical Methods." Principal speaker at the symposium was William H. Smith, manager of the Analysis Department of the Ford Motor Co. at Dearborn, Mich. Following Mr. Smith's talk a panel of experts answered questions regarding the application of statistical methods to the manufacture of rubber goods and to the control of the raw materials that go into these goods. The panel included Joseph Torrey (Goodyear), Harold J. Harmon (General Tire), Leonard M. Freeman (Goodrich), R. J. Luebbers (Firestone), M. E. Marks (Columbia Chemical), and A. B. Freeland (Ohio Rubber).

In his address, Mr. Smith stated that statistical methods of control are intended for the prevention of production of defective parts rather than for weeding them out after they are produced. He pointed out that many manufacturers perform inspections solely to sort out products that they must keep off the market and thus waste a great deal of valuable experience that could be used to build quality into the product in the first place.

The speaker also mentioned that industry sometimes shies away from putting quality experience to work because it stems from statistical theory. This attitude is not justified, he said, because intelligent use of these methods is no more difficult than changing a tool bit. In pointing out that statistical methods are so flexible they can be used in any kind of industrial activity, Mr. Smith said that Ford has 14,000 chart control applications in machining, processing, assembling and receiving operations. The panel discussion follows:

Question—Most writings and instructions on the subject of quality control deal with specific applications in the metals industries, or in cases where close control over dimensional variation is the primary aim. To what extent is modification necessary in adapting statistical techniques to the needs of the rubber industry?

Answered by Mr. Torrey: In the metals industries, a large proportion of the quality control effort is exerted in the direction of holding dimensional variations within close limits. This is necessary not only to insure performance in service, but also to facilitate the assembly operations. Matching parts which are off dimension cannot, in many cases, be assembled at all, and in others produce a result which may cause rejection at the next checking point. In the fabrication of rubber articles, however, dimensional variation is much less of a factor.

Components which vary considerably from specification can be assembled without any particular difficulty, and in many cases material may be considerably out of tolerance, in either or in both directions, without producing any appreciable effect on serviceability. For instance, treads which are run too heavy, or plies which are cut too wide, can usually be applied without difficulty, and without detriment to the product, though in such cases there is obviously a waste of material. On the other hand, of course, rigid control of such features as cord angle, tread length, etc., is of major importance from the standpoint of quality.

Dimensional data is, of course, used extensively as a means of assessing and maintaining levels of performance, and of keeping the cost of material used in the product in line. But, the condition of materials and the workmanship applied to their fabrication and assembly, are major considerations in determining the serviceability of the product.

The characteristics which make rubber valuable are its elasticity and its ability to change dimension, and at every point in the manufacturing operation the rubber manufacturer is up against such factors as dimensional change, through shrinkage, etc., which continues almost indefinitely, distortion which enters the picture whenever a component is handled, and the effect of changes in the nature of the rubber compound itself with respect to such characteristics as tack, bloom, etc. The quality of the product, therefore, depends very largely on the effort and skill of the organization, or the operator, in controlling and minimizing the effect of these variables, and for that reason a control system in a rubber plant probably includes a greater proportion of "P" (percent defective) charts, than will be found in industries where dimensional control is the primary aim.

The second point is the fact that rubber manufacturers (particularly the larger companies) are converters to a greater degree than is found in most industries, and the materials they use are raw materials in the best sense. They take their rubber directly from the plantations, cotton right from the cotton fields, sulfur from the mines, carbon black from the kilns at the oil fields, etc. In tire and tube manufacture, valves are about the only fabricated or semi-fabricated component which are purchased.

As a result, the sampling and inspection of incoming materials, though extensive, is a fairly simple process, and therefore absorbs less of the quality control effort than is the case in the metals industry, where most manufacturers purchase a large percentage of their components complete from other specialist fabricators. The

basic system is, of course, the same in both cases. The difference lies in the distribution of control effort, which in rubber manufacture must be directed more towards the operator, than in the direction of a machine condition.

Question—How would the "acceptable quality level" of rubber goods (good quality mechanical rubber parts) compare with metal or other precision parts in application to incoming sampling acceptance plans?

Answered by Mr. Luebbers: The rubber product will be measured with less precision than the metal product and also the "acceptable quality level" might be lower for the rubber goods than for the metal product. For example, an "acceptable quality level" for mechanical goods might be 5% of parts out of tolerance, which for metals may be ½%. Actually, for either industry, this figure might vary from very low to very high depending on how tight the tolerances have been set.

Question—Where is the best place to start a statistical control program: on incoming materials, finished product, or processing methods and equipment?

Answered by Mr. Freeman: Generally speaking, the best place to start a statistical quality control program would be on very simple laboratory or factory operations. Among the considerations which might determine the particular selection should be the similarity between an operation and the basic examples of applications in the metals industries. Such a start will allow a quality control engineer to study and develop methods for applying the various statistical techniques to the particular industry involved. It would probably be undesirable to start a program on either incoming materials or finished products. The reason for this is that although the possibility of rejecting good material and accepting bad material has always existed, as soon as this happens with the quality control system, many doubts will be cast at the statistical methods which are usually new and strange and often mysterious to vendors or production personnel. It would appear much more desirable to let these people feel that these methods have already been proved in the industry.

Question—During the compounding of rubber there are many variables present which affect the properties of the final product. Furthermore, many different machines are used which give rise to variation. Since this is the case, can it assumed that statistical laws apply, i.e., is the probability theory valid?

Answered by Mr. Marks: The use of statistical quality control depends on a random distribution of each variable present in any particular process. In the case of compounding, each variable has its own random distribution. Also each machine used adds its own random effect. The total result then is the sum of these variations which can be treated separately or as a whole. Thus, it is possible by quality control to separate each variable and analyze it by itself or to test the total variation on the final compounded material. The number of variables is not important; it is the variation in the final product that is important.

Question—Are control charts kept for raw material properties?

Answered by Mr. Marks: Generally speaking, statistical methods are used in the rubber processing industries for controlling the quality of raw materials; this does not necessarily involve the use of the control chart techniques. However, these methods are in some instances being used by the suppliers to control daily production. In at least one reinforcing pigment plant the methods are being used to good advantage to control the quality of daily production, to determine trends in production quality, to set up production specifications, and to analyze data from development and research investigations.

Question—Through quality control analysis, has anyone been able to determine with reasonable accuracy the relative effect on batch quality of raw material variations versus processing variations?

Answered by Mr. Freeland: At this time, there is no clear-cut, all-inclusive answer to this question. Each plant has its own particular problems of equipment, manpower, and stock specifications which all affect the result. On one type of stock, the materials variations may be the principal cause, while on another stock, it may be the control of compounding equipment, Banburys, mills, etc.

Question—Is the panel acquainted with any application of actual control charts to Banbury batch mixing times as recorded by Esterline-Angus Wattmeters?

Answered by Mr. Freeman: No. However, some information concerning the use of control charts in conjunction with a Banbury temperature recorder is available in the article "Quality Control of Factory Mixed Batches of Rubber Compounds," by Paul E. Gnaedinger of the Dominion Rubber Company. This article appeared in the March, 1949, issue of RUBBER AGE.

Question—Has statistical quality control been applied to calendering operations?

Answered by Mr. Torrey: Quality control of calendered fabric starts, of course, with the fabric itself. The textile mill is expected to produce fabric within certain limits of uniformity, and it is the rubber manufacturer's function to assure himself that the limits are being met, either by maintaining control in the mills he operates himself, or by appropriate inspection of the material as received.

As a preliminary to the calendering operation, the general practice is to predip the fabric, and control in the factory obviously must start at this point. The three factors to be controlled at this stage are the amount of dip applied, and the length and width changes encountered in this operation. Of these three, width variation is the major problem, so it seems logical to use width as the variable to plot for control of this operation. In the calendering operation proper, there are two important variables, namely, width (which governs cord-count) and gum deposit.

It has been demonstrated that variations in calender "squeeze" can produce differences in the overall gauges of fabric calendered with a uniform deposit of gum, and for this reason the gauge of the composite sheet is seldom used as the primary control in this operation. Most calendering processes set out to control the weight of compound applied per unit of area. One effective means for maintaining such control is by determining the average weight of gum per square yard applied to each roll, as taken from the calender wind-up. This, of course, requires an accurate length measurement at that point, and close control of width, in order to determine the roll-area. This, in turn, compared with the amount of compound picked up by the roll (established by weights taken before and after calendering) furnishes the unit weight figures used to decide between accept-

ance or rejection. The most troublesome factor at this stage is that of width variation, and for this reason it seems advisable to use this as the variable for plotting calender performance.

In tracing down defects and in the general effort for improving calender technique there is, of course, need for unit weight plotting from samples taken throughout, and across, the roll; but it should not be necessary to go to this length. This subject is also discussed in an article entitled "Developing a Calendergraph," by Anthony Oladko of Johnson and Johnson, which appeared in the September, 1949, issue of RUBBER AGE. This article explains the use of control charts as well as methods for determining process capabilities.

Question— What practical applications have been made in the tire industry, particularly in connection with in-process control?

Answered by Mr. Torrey: Statistical charts are being used effectively for control of most of the more important processes in rubber goods manufacture. In addition to the cases quoted in the preceding answers, control charts, using one or two selected variables, are effective on such operations as: extruding (treads and tubes), milling, gum calendering, breakers (calendering and lay-up), beads (insulation and building), ply and band (cutting dimensions and assemblies), passenger tire building, pre-cure inspection, curing ("P" chart), post cure (inspection and balance), tube valve manufacture, tube splicing, tube manufacturing ("P" chart), tube inspection, and labeling.

Most of these can be developed to a point where they pin point the operator or unit which is an important consideration. In addition, it is desirable to maintain charts on a number of items evaluated by checks made on the cured product, such as tire weight, bead width, run out, tread curvature, etc. Such items, though not necessarily the responsibility of any individual operator, should be kept under close control for technical and service considerations.

Question— What are some examples of statistical control that have been carried out successfully in mechanical goods production?

Answered by Mr. Freeland: Various plants have been very successful in a variety of applications, such as molding of motor mounts, grommets, vibration dampers, etc., and extending over into such phases as control of adhesion quality on rubber to metal bonding jobs and deflection quality. Actual charts have been plotted on individual press operators to control rejects in the process. Charts on adhesion tests have been used successfully to isolate causes for poor adhesion and obtain correction. In many cases excellent results have been obtained by the use of the simplest form of control charts, with control limits set up in some cases on practical operating rules rather than actual statistical control limits.

Question— Is the application of standard sampling tables to molded goods practical where molds consist of 25-50 cavities?

Answered by Mr. Freeman: In most cases dealing with small-sized molded goods, the standard sampling tables will not be found to be satisfactory for process control where a mold consists of 25-50 cavities, because the cost of adequate sampling and inspection is likely to exceed that which can be tolerated. For lots of 25-50 pieces, samples as small as 5 or 6 pieces give AOQL's in the range of 5-7%. Such an AOQL would probably be objectionable to a manufacturer or retailer receiving material of this quality. Larger samples necessary to reduce the AOQL would, of course, increase the inspection cost. Several other statistical quality control techniques would probably be much more suitable in this case.

Question— Are short runs as applicable to statistical control as long runs?

Answered by Mr. Luebbers: Yes, they are as applicable. In fact, we have had our greatest success on short intermittent runs. With this type of production, scrap or rework at beginning of run, while the machine is being adjusted to give satisfactory product, may amount to a large percentage of total volume of material processed. With this in mind, we have set up controls on the various adjustments that can be made in the processing operation as well as on the finished product. Basically, this standardizes the processing operations from run to run which results in a reduction in time between starting up of run and the production of satisfactory product. In the rubber industry particularly, it is short intermittent runs that offer the greatest promise of showing a savings in scrap and rework as well as improvement in product quality.

Question— Do intermittent runs impose special problems?

Answered by Mr. Freeman: The greatest problem encountered with operations where intermittent runs are the rule is that of impressing people with the fact that any operation which is "in-control" should remain "in-control" regardless of the time intervals involved. Let me point out that although control charts show a plot of variables versus time, the time factor is actually a method for giving the order-of-occurrence of events and is not considered as a variable itself. Therefore, the problem of intermittent runs is actually only a problem of continuing established control procedures as each new run is started.

Question— What is the minimum number of specimens necessary to determine, with a good degree of certainty, the characteristic stress-strain properties of a typical rubber compound?

Answered by Mr. Freeman: No one "minimum number of specimens" can be definitely stated. However, there is a statistical formula $t = \frac{d\sqrt{n}}{\sigma'}$ which can be applied to determine the sample size necessary in each case studied. In this formula, t represents the probability of obtaining the correct result and is chosen on the basis of expected risk. Thus, if it is desired in a group of tests to have not more than one out of ten chances for incorrect results, t would be obtained for that stated risk from a probability table based on normal frequency distribution. d is the allowable difference between the true value and the results obtained. σ' is the true standard deviation of the results and is usually taken as the average σ obtained from a substantial number of tests. With these values determined, it is then possible to compute n, the number of specimens required. The formula mentioned may be found in the book "Industrial Statistics" by H. A. Freeman. However, no examples are given in this text for the particular application mentioned here.

Question— When running laboratory tests, are you measuring product variability or testing variability?

Answered by Mr. Luebbers: When taking any measurement or running any test, the data obtained always includes both product variation and testing or measuring variation. It has been general practice in the past to either ignore the testing and measuring variation and assume all the variation to be product variation, or to estimate by experience and guess work the test accuracy, and temper your conclusions according to your estimate of the reliability of the test.. Statistical techniques are available to determine quite accurately the precision of any measurement or test. A simple technique which has many applications is to repeat a test or measurement a large number of times on the same sample or parts of the same sample. It is quite logical to assume that the variation obtained by such repeated testing is test variation. The standard deviation is then calculated as an index of the test accuracy. The true product variation can then be calculated as follows:

$$\text{Product } \sigma^2 = \text{Measured } \sigma^2 - \text{Test } \sigma^2 *$$

Question— Are control charts used to determine limits for laboratory control of uncured batch stock?

Answered by Mr. Luebbers: Since I believe it is general practice in the industry to take only one sample from each batch of uncured stock for test purposes, the usual $\bar{X}$ and R charts would not be applicable since no values for R would be available. If two or more samples were taken per batch, the $\bar{X}$ and R charts could be used with the limits being computed from the average and range. When only one sample per batch is taken, the procedure is to plot a histogram of the test results and calculate the standard deviation. Limits are placed on the histogram 3 standard deviations from the average and values falling outside these limits are assignable; that is, not chance variation to be expected.

Question— How can quality control be used to check the precision of physical control laboratories?

Answered by Mr. Marks: The precision of any physical test can be determined by running daily tests on a standard sample. This standard is prepared daily by compounding from a large stockpile of standard ingredients, milling and molding under standard conditions, and testing in the usual manner. The data, for example, from a stress-strain curve can then be statistically analyzed and placed on an $\bar{X}$ and R control chart. The precision can be calculated from the upper and lower control limits. Any uncontrollable errors which occur are easily found since they will appear outside the limits. The precision obtainable at various places in the preparation and testing of the rubber can be found by making suitable experiments wherein other variables which are held constant are eliminated by a variance calculation.

Question— Are analysis of variance techniques more suited for interpretation of data in relation to compounding?

Answered by Mr. Freeman: Analysis of variance techniques are very powerful statistical tools which are generally best suited to interpreting the results of carefully planned experiments which are usually limited to a predetermined size and pattern of sampling. They are used for evaluation of assignable causes of variations. Analysis of variance techniques would be extremely difficult to use as a permanent factory control since few statisticians are normally available in factory operations. time gives supervision a very good argument in selling However, other methods involving the simpler control charts can often be set up to give the same information in an easily understandable form.

For example, a control chart for ranges may be used to show the variation "within samples"; a control chart for averages may be used to show the variation "between samples", while the control limits on this chart may be interpreted as giving a comparison of "within sample" and "between sample" variations. A control chart for individual readings may be used to show the "total" variation of the process and the control limits on this chart give a comparison of "within sample" variations with "total" variation of the process. Such control charts are easily explained and being readily interpreted by production personnel can be used as a basis for immediate action in factory operations. In general, the use of analysis of variance should be limited to operations for which a trained statistical engineer is available.

Question— If data from four different test laboratories (on a standard sample) are grouped and 3 sigma limits calculated for each laboratory, exactly what information is obtained that was not previously known?

Answered by Mr. Marks: Statistical quality control is especially useful for determining the variation in results between laboratories. This can be accomplished by setting up quality control charts for each laboratory and one between laboratories. However, better tools are available for the job than "3 sigma limits"; for example the "t" test or a similar test of significance. This type of test would show if the differences between the laboratories were real or chance.

Question— When more than one person is involved in a specific operation, how should quality be measured?

Answered by Mr. Harmon: We use "P" charts, pinpointing the crew rather than the individual. While we don't feel that charts of this nature produce the results of individual charts, we have been able to instill a spirit of competition between crews, which has given us definite results in waste reduction.

Question— Should a statistical quality control curve be established on an operation where certain elements to be considered are the result of defective work performed by others?

Answered by Mr. Harmon: In no case should an operator be charted where an element of doubt exists as to who is responsible for the defective work. We have "P" charts on our tire cure men, but only certain defects are charged to this operator. These defects are listed and each cure man knows and is in agreement before the chart is started that the listed defects can be caused by faulty workmanship in the laying of the tires. If an element of doubt exists, the chart loses its effectiveness.

Question— Can statistical quality control be used as an element for promotion?

Answered by Mr. Harmon: Very definitely. Performance records become a part of the individual's personnel file and a good record carries considerable weight when men are being selected for training or supervisional work. The reverse is also true in that a continued poor performance by an operator over a period of time gives supervision a very good argument in selling people to bid off a job for which they are evidently not suited. In several instances, operators have requested a transfer because of their continued poor performance

on the quality control chart. In these instances, no attempt has been made to use the chart as a club, but rather as a selling point to convince the individual that he is not qualified for this particular type of work.

Question—Can statistical quality control methods exist on operations where inspector's judgment, and not tolerances, are the criteria for acceptance or rejection?

Answered by Mr. Torrey: In rubber goods manufacture, there are probably a larger number of cases where the judgment and experience of the inspector must be relied upon for the acceptance or rejection of material than there are in most other industries. No statistical quality control system in a rubber plant would be complete that did not include a number of chartings where such criteria are used. The main requirement in such cases is to avoid hair-splitting decisions. We have found it good practice to have inspectors check all questionable items with supervision on the spot, and obtain their agreement to the justification for criticism before including them in the inspection report.

Question—Are statistical methods applicable to the analysis of road test data from fleet tire tests?

Answered by Mr. Freeman: Yes. Statistical methods have been very successfully applied to analysis of tire road test data. An article, "Use of Statistical Methods in the Planning of Road Wear Tests", by J. M. Buist, R. G. Newton and E. R. Thornley, was published in the *Transactions of the Institution of the Rubber Industry* on this subject. The article appears in Vol. XXVI, No. 4. Analysis of variance techniques are used and the methods described are quite complicated. It is beyond the scope of this discussion to cover the details of this application here, especially since considerable training in statistical methods would be a necessary prerequisite for proper understanding.

Question—Can statistics be applied in research on rubber?

Answered by Mr. Marks: One of the most promising but least used fields for statistics is in the laboratory. Too many research reports contain qualifying statements based on judgment alone. Any set of data obtained under controlled conditions is amenable to statistical analysis. By its use the research chemist can make a definite statement. The data are either significant or they are not. While it is true that in many cases the answer is obvious, in many other cases it is not. How often have we heard a research man say: "This set of data shows that the temperature had no effect, because the data was not precise enough"? Actually, a statistical analysis might have shown a trend and a valuable contribution to the experiment may have been missed. By use of these methods, experiments can be properly planned so that all the information needed is collected. Actually, less work can result in more and better conclusions. By variance methods the variables can be changed scientifically to give best results whereas usually only one is changed at a time.

Question—On what basis can the cost of installing a quality control system be sold to management?

Answered by Mr. Harmon: We feel that quality control must be sold to management on the basis of improved quality of the product. Your aim should be to improve constantly the quality of your product, and a statistical quality control program properly installed and administered allows maintenance of a high quality level and an increasingly better product. The resultant reduction in waste and the savings in dollars and cents can be used as a selling point, but we do not recommend it. The amount of money spent on accumulating and charting the information necessary for an adequate S.Q.C. system depends almost entirely on the quality consciousness of the management of your particular concern.

Question—What is the best method of selling statistical quality control to non-interested foremen and supervisors?

Answered by Mr. Torrey: Most difficulties with supervision in the matter of installing statistical practices arise from incomplete understanding. After all, the statistical chart is intended primarily for the use of production supervision since without this group's interest and support there is no assurance that action will be taken on any conditions brought out by postings, and without such action any control system loses much of its effectiveness. The first requirement, therefore, is that the production men be given a clear idea as to the reason for selecting the control point, the method by which the checks shall be made, and the way in which the detail of the posting shall be handled. Once this has been done, there is little reason for anticipating opposition from supervision to any such activity.

Of course, in those cases where the production department is expected to undertake the expense of the spot check, the situation is more complicated, as the foreman will naturally wish to have some assurance that the results obtained will be worth the effort and expense incurred. About the only approach in such cases is for the quality control organization to use its own personnel to carry out the initial stages of the application and bring it to a point where its advantages are apparent to all. Thereafter production supervision may be expected not only to use the chart in question effectively, but to initiate requests of their own for similar postings on other processes.

Incidentally, a point which eventually contributes heavily to the selling of a statistical system is the protection it gives a department against unjustified criticism from others. We are all familiar with the individual who, when trouble develops in his own section, immediately rushes off to another department in an attempt to hang it on somebody else. Nothing goes further towards breaking up this habit than for an individual addicted to this approach to be steered up to the control chart covering the operations in question, and to be shown in a way which permits no argument, that the trouble lies elsewhere.

Question—How much, if any, should labor be instructed on the purpose and interpretation of a new control or of the system as a whole?

Answered by Mr. Freeman: Labor plays one of the most important parts in the success or failure of any new control system. One practice is to chart an operation for at least thirty days in the control office until it is certain that the information is accurate and that the chart portrays the true conditions of the job. The general foremen then call the department representative into the office and go over the program in detail. The employees who operate the machine are then called in and a complete explanation is made of the proposed chart and the defects with which they will be charged. It is believed that these people want to know how they com-

pare with other operators on the same machine. We attempt to create pride in workmanship, and we know from experience that they appreciate knowing exactly where they stand on quality workmanship. No attempt is made to do a hurry up job of installing charts in any department. The ground work of contacting the union and the workers themselves is essential to get the cooperation of the employees.

Question—Which has the most appeal to the average piece worker as a reason for improving his work: "cost saving" or "improvement in quality"?

Answered by Mr. Harmon: The answer to this is very definitely "improvement in quality". We believe that 99% of all workmen want to do good work. They also do not want to look bad. The biggest advantage that has been found in the use of S.Q.C. charts is the competition aroused among individual workmen on a particular machine. One company has recently started the practice of awarding an automatic pencil to each employee who has attained a perfect goal on the S.Q.C. charts for a 30-day period. It is surprising the amount of interest that is generated by some little reward offered for good workmanship.

Question—What are the arguments for and against attempting to chart information in such a way as to pin-point the performance of individual operators?

Answered by Mr. Freeman: It is usually most desirable to pin-point the performance of individual operators, machines, etc., as much as possible. This prevents the "averaging-out" effect which the grouping of results gives and which permits poor workers a chance to slip by. Pressure is sometimes exerted to prevent such pin-pointing but this is usually aimed at allowing the poor workers to go unnoticed within a group. Jealousies or individual antagonisms are generally not aroused when the workers fully understand the control system and when care is exercised to maintain its impartiality.

Question—What recommendation can be made toward interesting suppliers in the use of statistical quality control methods and reporting such data on each shipment of material to customers? Just what is expected of the supplier in quality control by statistical methods? Will this not increase overhead for the supplier? How do you overcome their objections when it is a seller's market?

Answered by Mr. Freeman: This is a rather all-inclusive question when you drag in sellers market, etc., however, we must go back to the basic principles of statistical quality control. Mr. Smith has given examples of how S.Q.C. has saved money in the many places Ford is using it. Therefore, the chances are good that when a supplier applies S.Q.C., he will save money over his present method of operation. Any manufacturing concern will buy that regardless of a buyers or sellers market. The manufacturer should also realize that he is already running tests to control the manufacture of his product. These may not be on a statistical basis but if he will review this procedure and put his sampling, testing and control of quality on a statistical basis then he will: (1) Improve the quality of his product; (2) Reduce costs as has been proven wherever it has been intelligently applied, and (3) Know the quality level of the material he is shipping.

Question—What will be the effect of the general adoption of statistical control in industry on its relationships with the Armed Forces inspection and procurement agencies?

Answered by Mr. Torrey: In view of the fact that all of the Armed Forces procurement and inspection agencies have adopted the statistical approach, there is no question but that manufacturers who are not familiar with it, or who do not use it, will be very much at a disadvantage in their dealings with the government. Several years ago when the Ordnance Department first published its pamphlet on statistical quality control a great many of its inspectors had insufficient knowledge of the subject to apply it effectively, and in such a situation there is great danger. Now, however, the government inspectors are being trained to a point where they understand and can use this system effectively, and we believe that the overall effect will improve the relationship between industrial concerns and government inspectors.

However, the principle of qualification of specific lots or shipments is something which must be approached with caution. There are relatively few government inspectors nowadays, and most of them do not have the time to check any considerable quantity of manufactured product thoroughly. Furthermore, whatever checking they do at this stage is necessarily with respect to surface conditions, most of which have little if any effect on field performances. It stands to reason, therefore, that any drastic action taken on the basis of inspection of this type and at this stage is probably unjustified. This will represent even more of a problem if the government inspection is increased, as the additions will almost certainly be men of less experience.

It seems to us that the main aim in this connection should be to induce government inspectors to watch for trends and tendencies in the condition of the product as shipped by the various facilities, and to take action on this basis in preference to holding up large lots of manufactured products because of the incidence of some superficial defect, where the aim should be to reduce it in future production rather than to comb it out of the material already produced.

Butyl Acrylate-Acrylonitrile Rubbers

(Continued from page 700)

LITERATURE REFERENCES

(1) Mast, W. C., Rehberg, C. E., Dietz, T. J., and Fisher, C. H., *Ind. Eng. Chem.*, **36**, 1022 (1944).
(2) Mast, W. C., Smith, Lee T., and Fisher, C. H., *Ind. Eng. Chem.*, **36**, 1027 (1944).
(3) Mast, W. C., Dietz, T. J., and Fisher, C. H., *India Rubber World*, **113**, 223 (1945).
(4) Dietz, T. J., Mast, W. C., Dean, R. L., and Fisher, C. H., *Ind. Eng. Chem.*, **38**, 960 (1946).
(5) B. F. Goodrich Chemical Co., Service Bulletins 47-SD3 (1947) and H-6 (Aug. 1950).
(6) Mast, W. C., Dietz, T. J., Dean, R. L., and Fisher, C. H., *India Rubber World*, **116**, 355 (1947).
(7) Mast, W. C., and Fisher, C. H., *Ind. Eng. Chem.*, **40**, 107 (1948).
(8) Hansen, J. E., Palm, W. E., and Dietz, T. J., Bur. Agric. and Industrial Chem., Eastern Reg. Res. Lab., AIC-205 (Sept. 1948). Processed.
(9) Mast, W. C., and Fisher, C. H., Bur. Agric. and Industrial Chem., Eastern Reg. Res. Lab., AIC-206 (Dec. 1948). Processed.
(10) Filachione, E. M., et al., unpublished data (1950).

A Safety Device for Use with Laboratory-Size Rubber Mills

By A. J. POYNTON

R. S. Crawford Fellow, Massachusetts Institute of Technology, Cambridge, Mass.

MODERN machinery is equipped with all manner of safety devices, but even so accidents occur. Safety devices available for the laboratory-size rubber mill include foot pedal, knee, and cable—types which are invaluable. However all these types rely on the operator tripping switches consciously, *after* the fingers have been caught in the nip of the rolls. As such these cannot be classed as safety devices, but rather as emergency devices. The ideal is to have a safety device which operates automatically, *before* an emergency arises, by preventing the fingers from reaching the nip of the rolls. It was with this in view that the gate type safety device was developed.

Essentially, this type of safety device consists of a swinging gate of ½-inch Lucite, or other transparent material, placed over the front roll, with clearance of one inch between the top of the roll and the lower edge of the gate. This allows the sheeted rubber to pass through, even when folded over, but not the hand. These features are seen in Figures 1 and 2.

The gate is keyed to a ½-inch shaft turning in standard ½-inch pillar block bearings which are attached to base plates. These base plates are fixed to the mill body. The shaft is machined at one end in the form of a double-acting cam, with the roller of a microswitch resting in the cut. Rotation of the gate in either direction depresses the lever of the microswitch, which is in circuit with the starter button at the front of the mill and the brake motor trip switch. Depression of the microswitch therefore stops the rolls instantaneously. The sensitivity of the microswitch may be adjusted by vertical movement of the microswitch.

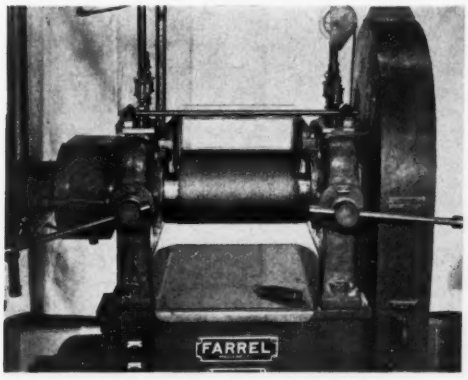


FIG. 1—Assembled safety device in position. Note that the clearance is sufficient to allow the sheeted rubber to pass through.

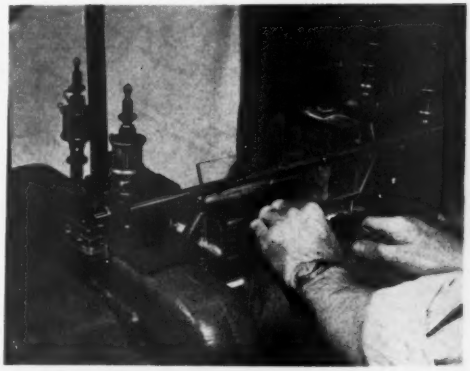


FIG. 2—Positioning of the microswitch is clearly evident in this view. Note how the hand, following up the rubber towards the nip of the rolls, rotates the gate, thus tripping the switch.

Figure 1 shows the assembled safety device in position, and also the clearance sufficient to allow the sheeted rubber to pass through. Figure 2 shows details of the positioning of the microswitch. It also shows how the hand, following up the rubber towards the nip of the rolls, rotates the gate tripping the switch. This feature stops the rolls *before* an emergency arises. Excessive rotation of the gate, which would probably damage the arm of the microswitch eventually, is prevented by pins in the shaft, operating in stops machined in the inner faces of the bearings. The pins also serve as end stops.

As can be seen from the illustrations, reaching the nip over the top of the shaft is prevented by a Lucite plate attached to the gate, extending one inch above the shaft at an angle of forty-five degrees to the vertical, so that any pressure from the top would rotate the gate and trip the switch.

It is felt that to be effective, a safety device should be as simple as possible. As can be seen from the accompanying illustrations the device is simple both in construction and operation. It requires no modification to the mill, the base plates being attached to the mill body by the posts carrying the cable safety device, and being positioned by the front oil cup pipes. The leads to the microswitch pass through a shield to insulate the connections. The complete assembly can be installed in about ten minutes, and does not interfere in any way with normal operation of the mill. The few, simple parts required are shown in Figure 3.

It is felt that this safety device would do much to make the slogan "Safety First" a reality in rubber mill operation. It is further felt that this device could be

adapted for use with roller mills other than the laboratory-size rubber mill.

This device has been developed during a thesis on "The Effect of Molecular Weight Distribution of Natural Rubber on its Reenforcement by Fillers," and has been made possible by the R. S. Crawford Fellowship for Research on Elastomeric Materials at the Massachusetts Institute of Technology. The fellowship has been endowed by the Elastic Colloid Research Corporation, who have loaned the equipment to the fellowship.

Helpful advice has been given by Professor H. C. Weber, Mr. H. Carter, and Mr. H. Chasen of the Department of Chemical Engineering, and Mr. M. J. Dondero, the Safety Engineer, during the development of the safety device.

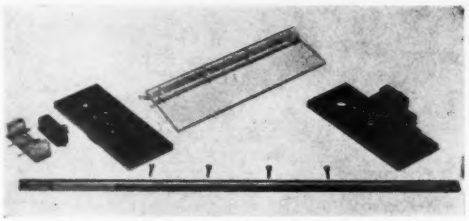


FIG. 3—The few, relatively simple parts required for the safety device are shown here. The swinging gate of transparent plastic is the major unit.

Rubber Manufacturing Activities in Various Foreign Countries

ADDITIONAL reports on rubber manufacturing activities in various foreign countries, compiled by the United States Department of Commerce from miscellaneous sources, including embassies and consulates, follow herewith:

Costa Rica: Two new small factories for the production of rubber goods were added to the Costa Rican rubber industry in the past year, making a total of five now engaged in the production of such items as heels, soles, mats, toys and balls, raincoats, and miscellaneous rubber goods. The aggregate value of the domestic output of rubber products in 1949 was estimated at 1,800,000 colones (colon=US $0.17857). Rubber requirements for domestic manufacturers were estimated in 1949 at 167,000 pounds, of which 118,000 pounds was produced in Costa Rica and 49,000 pounds were imported. No rubber other than natural was used in the industry. Production of rubber, both estate and wild, is expected to increase slightly in 1950.

According to the Director General of Statistics, the importation of rubber products in 1949 amounted to 365,769 kilograms (kilogram=2.2046 pounds) valued at US $425,986 c.i.f. Costa Rican ports. The United States percentage of these imports was 82.58 of the total volume and 80.53 of the total value. Among the imports from the United States were 10,590 motor vehicle tires valued at $271,439 and 89 tractor tires worth $2,571. Inner tube imports from the United States amounted to 14,696 kilograms valued at $12,105.

British East Africa: The total British East African market for all types of rubber products in 1950 was estimated at the equivalent of about $4,000,000. Using the present value of sterling (£1=$2.81375), the market for principal products represents approximately $2,000,000 for tires, $250,000 for inner tubes, and $177,000 for transmission, conveyor, and other types of belting and hose, including fan belts and radiator hose for automobiles. Estimates, based on vehicle registrations in Kenya, Uganda, Tanganyika, and Zanzibar, are 11,500 tires for passenger cars and motorcycles, 37,400 tires for trucks, buses, tractors, farm machinery, and earth-moving equipment, and 71,750 inner tubes of all types.

Gross imports of rubber products into Kenya, Uganda, and Tanganyika (Zanzibar figures not available) in the first half of 1950 reached a value of £969,385 ($2,727,607).

The greatest problem in the East African market is supply, especially of certain types of goods. The condition was eased a little in 1949, mainly because several United States companies had established factories in the sterling area and were able to supply most of the normally used rubber products. It is now only when sterling area manufacturers are unable to supply or delays in deliveries are uncommonly long that exchange is released for purchases outside the sterling area.

Haiti: A brisk upturn in trade in rubber goods, particularly tires and tubes, which has developed in Haiti since the outbreak of the Korean war has relieved merchants, who were overstocked at the beginning of 1950.

Haiti is entirely dependent upon imports to supply its rubber needs. Its imports of rubber goods in the fiscal year ended September 30, 1949, were valued at 1,900,289 gourdes (1 gourde=US $0.20). Tires and tubes valued at 1,540,337 gourdes constituted nearly 78 percent of these imports. The principal source was the United States, which supplied tires and tubes worth 1,341,882 gourdes. The value of all rubber products imported from the United States in the last fiscal year was 1,769,941 gourdes, or 88 percent of total rubber imports.

The United States is likely to continue its lead in the Haitian market, although active competition is expected in tires and tubes from Canada, France, the United Kingdom, and the Netherlands. The United States benefits from physical proximity and resultant quick delivery and so far has not had serious price competition. Demand is expected to remain fairly constant, as it has over the past few years.

Peru: A substantial decline in Peruvian production of tires in the first 6 months of 1950 was attributed to diminished demand. The reported output was 29,084 tires, a decline of 26 percent compared with the 39,351 units turned out in the second half of 1949 and 19 percent compared with production of 35,843 tires in the first half of 1949. On the other hand, the output of 21,256 tubes in the first half of 1950 was but slightly less than the 21,590 produced in the corresponding period of 1949. Production was more than adequate to cover requirements, however, and the supply situation was easy.

Manufacturers anticipated the usual seasonal increase in production in the second half of 1950, and estimates of tire and tube production were for 43,800 and 30,500 units, respectively.

Editorials . . . . . .

Another Cartel?

IS ANOTHER international rubber cartel in the making, this time with the United States as a full-fledged partner? If such a cartel is in the making, will it embrace both the production and consumption of natural and synthetic rubber? Will it cover the equitable distribution of natural rubber supplies among the so-called Western nations only? Will it be used as a weapon to control the shipment of natural rubber to Russia and its satellites? These are some of the questions which are being asked in international rubber circles and which are causing some raised eyebrows among American rubber manufacturing executives.

The questions are occasioned by the little-publicized conference on world rubber problems held in London the week of February 5. According to the announcement of the conference made by the British Board of Trade, its purpose was to "review the supply and demand situation of natural and synthetic rubber and seek an equitable distribution of 1951 and 1952 supplies." Delegates from the following nations were in attendance: Canada, Ceylon, France, Great Britain, Indonesia, Italy, the Netherlands, Thailand, the United States and Vietnam. In addition, a delegation representing the British colonies was also in attendance.

Although the expressed view of the conference was to review the supply and demand situation of rubber, it is difficult to accept this premise in view of the fact that a regular meeting of the International Rubber Study Group is to be held in Rome next month. One of the major functions of this group, if not its sole raison d'etre, is to estimate production and consumption figures for forthcoming periods of time, generally a two-year period. Surely there is nothing so pressing in the over-all rubber picture which could not wait another sixty days for the regular meeting of the International Rubber Study Group. Accordingly, the London Conference has led to a number of conjectures.

Although no official or semi-official word has been issued on the conference held in London, it is understood that the possibility of an inter-government purchase agreement for Malayan rubber was explored. Further, Washington sources report that the American delegation proposed that any purchase agreement be limited to one or two years, or about the time it will take to attain the stockpile objective. The British countered with a plan covering a five-year period to assure a continued large American market after the stockpile is completed. It is also understood that the American delegation sought some action to curb shipments of Malayan rubber to communistic countries.

Despite categorical denial by government officials in Washington that an inter-government purchasing agreement has been achieved or is in the works, the rumors will not down that an agreement of some sort has been concluded. These rumors cover a number of tonnage and price figures ranging from 100,000 to 400,000 long tons and 50 to 60 cents a pound. The most persistent rumor, regarded as fact in many circles, is an agreement covering 100,000 tons, to be delivered in lots of 10,000 tons monthly, at a price of 54 cents a pound for No. 1 Ribbed Smoked Sheet and correspondingly lower prices for off-grades. No comment is available as to whether this price of 54 cents a pound is on an f.o.b. or c.i.f. or c. and f. basis.

There are many who argue that an arrangement of this kind would serve the interests of all concerned. On the one hand, it would be most beneficial for the rubber estates in Southeast Asia in that it would permit a guaranteed minimum income for a substantial part of production for at least a year, and on the other hand would give the American stockpile the desired top grades of rubber. There are others, however, including John Collyer of Goodrich, who argue that any agreement of this kind will serve only to keep the price of natural rubber at high levels. The thinking of this latter group is that in the natural course of events, the price of rubber is bound to fall to lower levels in the very near future, particularly since the government is now the sole purchaser of rubber for the United States.

As indicated above, all of this is conjecture but nevertheless disturbing to the already turbulent waters of the domestic rubber manufacturing field. One might well ask why all the secrecy surrounding the London Conference? A simple statement issued by the conferees could easily dispel all of the rumors and reports. The American rubber manufacturing industry can readily absorb fact, as it has over the past ten years, but it has few weapons to battle rumors and reports. European diplomats are steeped in intrigue by tradition. Must the American diplomats fall into the same pattern? Give us the facts.

CURRENT NEWS OF THE MONTH

NPA ORDERS SIMPLIFICATION OF PRODUCTS AND LIMITS USE OF NATURAL IN END-ITEMS

THE National Production Authority in Supplement 1 to Order M-2, issued on February 19, ordered simplification of rubber products as a means of conserving rubber for the mobilization program. The order reduced the number and types of styles of tires, inner tubes and industrial goods that a manufacturer may produce. Subsequently, on March 1, NPA issued an amendment to Order M-2 which established new quarterly civilian consumption ceilings and limited the natural rubber content of end-products. The order, as amended, was made effective as of March 1 except for the end-product specifications, whose application was delayed until March 15. NPA said that the delay in the application of specification controls was to give manufacturers more time in which to revise production schedules and make technical adjustments.

Supplement 1 to Order M-2, as issued February 19, ordered manufacturers of truck tires to make one line each of standard tread-depth and extra tread-depth tires. Also, the manufacturer may not make more or different lines of special purpose tires than he was making when the order became effective on February 19. Under the order, farm tractor and implement tires are limited to a single line, and passenger car tires are limited to black sidewalls only.

In standard tread-depth passenger car tires, a manufacturer may produce only one line and one quality. Only one line of extra tread-depth passenger car tires may be manufactured, and the number of these tires that a manufacturer may make in any calendar quarter may not be in greater proportion to his total production of passenger car tires than it was in the last six months of 1950.

All other pneumatic tires, including those for motorcycles, bicycles, derby racers and scooters, may be made with black sidewalls only. A manufacturer may produce inner tubes in any color, but in only one color.

Industrial Rubber Goods

Manufacturers of industrial rubber goods are limited in these ways: Conveyor, elevator, transmission and "V" belts may be black only, except those designed for handling unpackaged foods or light colored products that may be marked or discolored by a black belt. Hose may be made in black only, except for garden, food conveying and creamery hose and air hose ¾-inch or less in diameter, the order states.

In the wire and cable field, all compounds for insulation may be natural color or black only; jacket and sheath compounds may be black only; but colors will be permitted for the identification of circuits.

NPA Order M-2 as amended, March 1, featured a change from monthly to quarterly allocations of rubber for civilian goods. This was made possible by a clearer picture of long-term rubber availability. The order provides a top civilian usage of about 90,000 tons of new rubber for each of the next three months—April, May, June—including 25,000 tons of dry natural rubber and about 5,000 tons of natural latex. This represents a slight increase from the January-February average of 88,500 tons. This pattern is expected to prevail for the balance of 1951. It provides a civilian consumption about 15% lower than the all-time high attained last year.

NPA previously said it had adopted a new set of uniform standards for weighing adjustments in rubber consumers' base periods, which determine allocation totals, as the result of a detailed examination of all base period adjustments granted. Revisions under this method reduce the base consumption (for the year ending June 30, 1950) from 1,430,762 to 1,076,110 long tons of total new rubber exclusive of natural rubber latex, effective February 19.

Effective March 1, consumers will be permitted to use 95 per cent of their adjusted base period consumption of new rubber, as opposed to the present 76 per cent and 48 per cent of their adjusted base period consumption of new natural rubber, as opposed to the present 35 per cent. This will mean a decrease from 27,000 long tons in February to 25,000 in March. The natural rubber figure will be subject to permissive revision.

In the matter of end-product specifications, the NPA presented to the Rubber Industry Advisory Committee a 32-page list of rubber products in which the natural rubber content will be reduced or eliminated on or about March 15. These end-product specifications have been tailored to fit the 25,000 tons of dry natural rubber which will be available in each month of the next quarter. Increasing proportions of synthetic, chiefly GR-S, will replace part or all of the natural rubber content in most of the items listed.

The amended Order M-2 provides for a blanket exemption from rubber allocations, but not end-product specifications, for any manufacturer using less than 25,000 pounds of rubber in any calendar quarter. The previous exemption figure was 15,000 pounds a month. This does not include natural latex, which is subject to separate allocation for the first time, under provisions of the order.

The order also provides for an increase in the production of camelback for retreading tires of 50% over base-period production by manufacturers who make both camelback and other products. There have been several additions to the list of products which may be made in a limited range of colors, usually black only, or are subject to style and grade limitations.

Monthly Consumption Reports

Monthly reports of rubber consumption and stocks must be filed regardless of the quantity involved, the order states. Small quantity users previously were exempted. A separate unit of the Rubber Division of the NPA has been set up to consider individual appeals from consumers who want to exchange part of their natural rubber allocations for synthetic rubber, or vice versa. In general terms, here is how NPA has dealt with a few of the major groupings of products using rubber:

Tires: NPA allows 100% use of natural rubber in pneumatic airplane tires, 13% in bicycle and 15% in motorcycle tires. Passenger car tires (through 7.10 and 6.50) are limited to 15% and (over 7.10 and 6.50) to 22%. Industrial pneumatic tires and tractor implement tires are limited to 13%. Truck tires fare better, ranging from 38% (7.50 and under) to 92% (over 12.0). NPA allows manufacturers to exceed the group average of any product in this section provided that the aggregate rubber consumed in all products of the section does not exceed the total amount on maximum group averages. Even in such cases, however, the maximum on individual items is limited to 95% for passenger vehicles and 95 and 99% on truck tires.

Tubes: No natural rubber may be used in ordinary passenger, tractor implement or truck (8.25 cross section and under) tubes. On truck tubes above 8.25 up to 14.00 the maximum is 5%; on those over 14.00, 80%. The usual amount required may be used in puncture seal and safety tubes, however.

Tire and Tube Repair Materials: The minimum amount required may be used in sectional air bags, bulk tire repair materials, tire and tube patches and patching cement.

Belting and Belts: As in tire walls, manufacturers of belts and belting are limited largely to the color black and to one line and quality for any one purpose. The percentage of natural rubber permitted ranges generally from 15 to 25 and 30%, although in a few cases they run to 25% and in one case (hog beater belts) to 40% natural rubber by volume. Flat transmission belting, however, is limited by a different system, the general restriction being one pound of natural rubber per 1,200 square feet of ply, and less in some cases.

Footwear: A group average of 70% natural rubber to new RHC is allowed for rubber footwear, though no one type shall use more than 98% natural. Shoe products are optional for line, type, quality and style, but natural rubber is limited to 5% in heels, soles and other specialized materials used in the manufacture or repair of soles. None may be used in crepe soles, heels, welting or wrappers except for sale to the General Services Administration.

Rubber Tile and Flooring: The use of natural rubber is prohibited altogether for use in rubber tile flooring, although natural rubber latex is permitted in coatings for fiber floor covering. Lines, type, quality and style are optional.

Mechanical Goods: Natural rubber content was generally reduced 15 to 20% below prevailing manufacturing standards for this segment of the industry, which accounts for about 22 to 25% of national rubber consumption.

Hose: General industrial hose for acids, the natural rubber content is placed at the minimum necessary for adequate performance; air and air tool hose natural rubber content is set at 30%; beverage and food at 40%; rotary drilling hose at 15%; oil suction and discharge hose at 15%, while for railroad hose the natural rubber content was set at 5 to 20% for selected types, with some products exempted.

Packing and Gaskets: Some are exempted, but others are limited from 5 to 50%, with most at 25%. The most natural allowed in jar rings is 25%, but natural is eliminated from molded stoppers and closures for food and beverage containers, except for food gaskets formed and vulcanized in closures.

Electrical Products and Industrial Equipment: Splicing compounds may employ 35% natural; flexible connections for vacuum and exhaust equipment, 25%; in some uses natural has been eliminated entirely, in some others the minimum necessary can be used.

Hard Rubber Products: Heavy sheets may use 30 to 50% natural; large tubing may also use 30 to 50%; parts for storing, conveying and processing corrosive chemicals may use up to 50% natural.

Drug Sundries: Most provide for the minimum necessary for good product performance, with very few limitations of natural use. There is no restriction on the natural rubber content of rubber thread.

Use of Rubber Tile Increasing

According to a recent survey by *Better Homes and Gardens*, approximately one out of every seven new homes include rubber flooring in kitchens and bathrooms. Robert G. Marcus, secretary and general manager of the American Tile & Rubber Co., Trenton, in commenting on the survey, stated that the one-out-of-seven ratio compares with the one-out-of-one hundred new homes built ten years ago. Mr. Marcus stated that his company has been working on the one-out-of-seven basis for some time and has lately intensified its efforts to increase the percentage of rubber flooring installed by home builders.

Athletic Goods and Toys: Liberal ceilings on natural rubber content have been allowed, with the natural rubber content of golf balls cut from the previously prevailing 95% to 85%. The order divides toys into two groups, latex and molded toys. In the latex group are dipped beach balls which can be made with up to 70% natural latex and slush-molded toys which can use up to 50% natural latex. Crib toys and doll skins can contain natural latex but only in the minimum amounts necessary.

Other Aspects of Problem

Government rubber consumption orders restricting the amount of rubber to be used in making civilian goods are causing some short time unemployment and threatening a reduction in working forces from the high levels in the latter half of 1950. A spokesman for the B. F. Goodrich Co. confirmed that his company had been obliged to reduce working schedules during February. Schedules of the Goodyear Tire & Rubber Co. are "irregular" and the Firestone Tire & Rubber Co. reportedly has also had some "short time" in various of its production departments.

In order to avoid widespread layoffs in the industry, international and local leaders of the United Rubber Workers have opened an investigation into the cuts in government rubber supplies and in the resultant layoffs. Union officials have estimated that layoffs because of the rubber cuts might reach 10,000 persons unless more rubber comes through or more work is found by the big rubber producing companies.

The Senate Small Business Committee, under the chairmanship of Senator John Sparkman (Dem., Ala.), has begun the task of checking how the government has been passing out rubber to both small and large manufacturers. A subcommittee under Senator Guy Gillette (Dem., Iowa), was scheduled to begin preliminary hearings on March 8 on the government's allocation and limitation program.

Small tire companies have argued that base period allocations favored the larger manufacturers who supply original equipment tires to automobile manufacturers. Purpose of the March 8th conference was to have been to consider what are the problems relative to cut-backs. A full-scale investigation under Senator Gillette is scheduled to start on March 19 or 26, as to how the limitations affect small business.

It is expected that the hearings will air some of the grievances developing over the recent dismissal of Earl W. Glen as deputy director of the rubber program. One of the major factors in the dismissal of Mr. Glen is said to have been his method of allocating rubber.

Stockpile Found Ample

A Munitions Board task group is now completing a study which indicates that the United States now has enough rubber to meet military stockpiling and normal civilian requirements. Gerald B. Hadlock, Director of the Office of Rubber Reserve, reported the task group's finding to a recent meeting of the Senate Banking Subcommittee.

Meanwhile, Warren Lockwood, director of the Natural Rubber Bureau in Washington, D. C., recently stated that international allocation was "the most practical solution" to parceling out limited supplies of natural rubber. This, he said, would bring an end to abnormal purchases by the Soviet bloc, and prevent another spiral in natural rubber prices.

As to purchases of natural rubber by Russia and her satellites, Great Britain has promised to review its policy on shipments of rubber to Russia from Malaya. Russia received 64,694 tons of Malayan rubber by the end of October, 1950, an increase of more than 1,000 tons over the whole of 1949. It was also disclosed that Malayan rubber shipments to Red China in November, 1950, totaled 9,302 tons and 7,180 tons in December.

Additional NPA Directives

Recent NPA actions of interest to the rubber industry included the informing of producers of naphthenic acid that a general chemical allocation order is being considered which would regulate distribution of chemicals to defense and civilian industries. The Chemical Industry Advisory Committee had previously urged the passage of such a directive in order to assure the orderly flow of strategic materials.

In order to assure the prompt and orderly filling of "DO" rated orders for high tenacity rayon tire cord yarn, the National Production Authority, on February 15, directed that producers of this yarn are required to accept "DO" rated orders up to 15% of their scheduled monthly production. Prior to this action, producers were required to take orders up to 10% of their monthly production.

The Industrial Products Division of the Flintkote Co. has opened a new office in the Cafritz Building in Washington, D. C., under the direction of Hayden A. Glatte.

REACTIVATION PROGRESSES AS RFC PRODUCES NEW TYPE SYNTHETIC

The government's synthetic rubber program received added impetus with the announcement on February 22 by the Reconstruction Finance Corp. that it had begun limited commercial production of a new type of synthetic rubber capable of eventually increasing GR-S output in present facilities by about 25%. The amount of the increase depends on industry acceptance of the new product, called "GR-S X," but the government is satisfied that it can make a high quality tire with only 75 to 80% of the rubber now going into the conventional cold rubber GR-S compound.

The development making this possible is the addition of readily available oils to cold-rubber GR-S, resulting in production of a compound that is only partly rubber, RFC explained. The compound, approximately three parts synthetic rubber to one part of oils, has matched the performance of all-rubber cold GR-S in experimental tires produced for RFC, officials said.

The same oils have been used for some time in building tires, but never before in the actual compounding with GR-S at copolymer plants. Cold rubber GR-S X, the agency said, is being produced in 100,000-pound lots for sale to rubber products manufacturers for test runs in tires. A number of manufacturers have asked for the material.

The decision to put the development into commercial production was prompted by shortages of rubber, according to RFC Chairman W. E. Harber. It represents a fresh departure in that RFC and the industry have concentrated their research heretofore on improving rubber quality, rather than quantity.

Dr. G. G. Oberfell, consultant to RFC's board of directors, said the rubber-oil compound can be used across-the-board as a substitute for conventional all-rubber GR-S. Mr. Harber described the material as a "tough, highly viscous cold rubber to which are added readily available rubber-processing oils." Where used, he added, it will "effectively extend the rubber supply."

The process of making the compound follows the pattern of the so-called black masterbatch method, mixing in furnace black with rubber hydrocarbon before it leaves the copolymer plant. A number of rubber companies, including the Goodyear Tire & Rubber Co. which disclosed the development in a recent statement, have shared in developing it. RFC has financed the research.

RFC spokesmen said that they had never received information on what is said to be a similar process from the General Tire & Rubber Co. Dr. Oberfell said that, to date, General Tire has only indicated that they have the process. According to Dr. Oberfell, General Tire has refused to make known any of the steps in the process.

In its announcement some time ago, General Tire emphasized that it developed the method in private research, that it financed all the work itself and did not use any RFC funds. Therefore, General Tire said that it should be compensated for its efforts the same as the discoverer of any other process or system. The company pointed out that the new method was not in the test tube stage but in actual use in Canadian plants where the government had adopted the process.

Other Reactivation News

According to an announcement by the B. F. Goodrich Chemical Co., production of cold rubber at the Port Neches, Texas, plant which the company operates for the government will be increased 50% within the next two months. The government has authorized the installation of refrigeration equipment costing $350,000 to expand cold rubber production from 30,000 to 45,000 tons of the plant's 60,000 ton annual capacity. It was point out that the Port Neches units are operating in excess of 135% of their rated capacity.

The Chemical Plants Division of the Blaw-Knox Co. is rapidly completing its contract from the B. F. Goodrich Chemical Co. to modify and reactivate the 90,000 ton government-owned synthetic plant at Institute, W. Va. This plant, formerly operated by U. S. Rubber, was built by Blaw-Knox during World War II and was placed in stand-by in 1948. One of the three production lines has been completed and was placed in operation late in January. Start-up of the second line is scheduled for the middle of March and the third, late in April. It is expected that the new facilities will be completed by May 15.

An explosion and fire rocked the Government-owned butadiene plant at Monaca, Penna., on March 6. The plant is operated by the Koppers Co. for the RFC. The government had authorized Koppers to reactivate three butadiene producing lines but only two had been placed in operation at the time of the fire. The units were said to be producing about 5,000,000 pounds of butadiene monthly. Officials said the unit could be rebuilt. Earlier estimates had placed damages at $500,000, but officials said later that the damages would not be this large.

The RFC has granted the Union Carbide & Carbon Co. a five-year lease to operate a government-owned carbide plant at Ashtabula, Ohio. The $3,500,000 plant is expected to go into operation by the end of March. Built during World War II as part of the synthetic rubber program, the plant has an annual capacity of 70,000 tons.

RFC has also authorized the Chemical Division of the Koppers Co. to reactivate the third of four alcohol-butadiene units at Kobuta, Penna. Koppers placed one unit of the government-owned plant in operation in November, one in February, with the third scheduled to start production in June. The plant was built and operated by Koppers during the war. Total monthly production of the three units is expected to reach 15,000,000 pounds.

Gerald B. Hadlock, director of the office of Rubber Reserve of the RFC, in a recent appearance before the Senate Banking Subcommittee, stated that the RFC was opposed to reactivating the third of three synthetic rubber production units at Torrance, Calif. Reactivation of the third unit was urged by the Minnesota Mining & Manufacturing Co. and the Pacific Tire & Rubber Co., who jointly operate the plant for the government. Mr. Hadlock said to convert this remaining unit to cold rubber production would cost about $1,000,000. To reactivate it for the production of standard GR-S would not be practical since the need is for the cold rubber type.

Instead, the RFC favors moving the equipment east to augment present cold rubber output at an estimated cost of $400,000. Present West Coast production is sufficient to meet the needs of that area, Mr. Hadlock said. Mr. Hadlock had ordered 12 idle reactors at Torrance to three Gulf Coast copolymer plants where, he said, they will produce 25,000 additional tons of cold rubber. Mr. Hadlock said that six reactors transferred earlier to the plant at Baton Rouge, La., operated by the Copolymer Corp., are ready to go into operation. Of the remaining twelve, six are scheduled for the Houston, Tex., and six for the Lake Charles, La., plants.

Study Rubber Sales to Russia

The governments of both the United States and Great Britain are currently reviewing sales of natural rubber to Russia and her satellites. The Government of Great Britain has stated that it will not suspend rubber sales from Malaya to Russia, but will look into the matter if sales become abnormally high. At the moment, about 14% of Malaya's rubber is going to the Russian bloc. Meanwhile, the U. S. State Department has stated that Russian rubber purchases in the Far East markets have been costing that nation a great deal more than the rubber is actually worth. The State Department says the rubber traders in the Far East sell top grade rubber at top prices but actually deliver inferior grades. The touchy international situation prohibits the Russians from complaining too much. However, it has been reported that Russia plans to route all its rubber shipments through London instead of directly to itself. In this way the Russians can get a look at what they are paying for before final delivery.

Griffith Rubber Elects Officers

At a recent meeting of stockholders of the Griffith Rubber Mills in Portland, Ore., Franklin T. Griffith was elected chairman of the board of directors. Zina A. Wise, formerly vice-president and general manager, was elected president succeeding Mr. Griffith. H. G. Wise was relected vice-president while Clarence D. Phillips was re-elected secretary. John J. Coughlin was re-elected assistant secretary.

General Tire to Make Gas Masks

General Tire & Rubber Co., Akron, Ohio, has received a war order from the Ordnance Department of the U. S. Army in excess of $6,000,000 for the manufacture of gas masks. The masks will be produced at the company's plants in Jeannette, Penna., and Wabash, Ind. The company produced gas masks at the latter plant during World War II.

CONNECTICUT HEARS TALALAY ON FOAM RUBBER MANUFACTURE

The February 23rd meeting of the Connecticut Rubber Group held at the Hotel Barnum in Bridgeport, Conn., featured an address by Leon Talalay, chief chemist of the Latex Division of the Sponge Rubber Products Co., Shelton, Conn. Mr. Talalay spoke on "Foam Rubber — Manufacture, Design, Engineering and Properties." Mr. Talalay indicated by referring to statistics the rapid growth of latex consumption in the United States during the past five years. In this period, he said, 60% of the latex consumed in this country was used in the manufacture of foam rubber.

Mr. Talalay described the general properties of foam rubber and touched upon test methods used in the evaluation of these properties. The relationships of density to tensile strength, elongation and hardness were discussed for natural rubber foam. A partial mathematical treatment of these relationships was presented by the speaker.

The loss of compression with repeated flexing up to 1,000,000 flexes, was demonstrated, showing the hardness to approach a terminal value. Mr. Talalay said that most foam rubber is made with cores projecting into the body of the foam. Coring design was discussed showing the trend toward a greater number of smaller cores.

Discussing the compounding of foam for its rubber technological properties, Mr. Talalay showed the effect of sulfur ratio, of increased loadings with clay, whiting, etc., and also the effect of substitution of natural rubber with both standard and cold GR-S latex (Type 5 and Type X-547). The differences between the standard and cold GR-S in latex foam was elaborated upon. The tensile and elongation of 100% X-547 was shown to be about six times that of 100% Type 5 foam.

The speaker then discussed the distinctive features of the two main processes in use for making foam, i.e., the so-called Dunlop Process and the so-called Talalay Process. He pointed out that the main differences lie in the steps of foam generation (mechanical entrainment of air versus catalytic decomposition of hydrogen peroxide), and in the gelling (delayed action hydrolysis of sodium silicofluoride at room temperature in the Dunlop Process versus coagulation in the frozen state by permeating the stereo-reticulate structure with injected coagulating gas in the Talalay Process, as described in U. S. Patent 2,432,353).

The speaker then discussed the colloid chemical conditions which must prevail in the latex compound for a successful operation of the foam process, i.e., the effect of surface tension, liquid film strength, viscosity, and of the conditions for the formation of the zinc ammonia complex (instrumental in the step of sol-gel transformation).

Lastly, the speaker discussed washing and drying, and referred to the modern equipment used in performing these "finishing" steps. He also touched upon the phenomenon of foam shrinkage.

The meeting program concluded with an address by Dave Powers, prominent lecturer, teacher and author.

Coming Events in the Rubber Industry

Mar. 16. Boston Rubber Group, Somerset Hotel, Boston, Mass.

Mar. 27. Washington Rubber Group, Cosmos Club, Washington, D. C.

Mar. 30. New York Rubber Group, Spring Meeting, Henry Hudson Hotel, New York, N. Y.

Apr. 6. Akron Rubber Group, Hotel Mayflower, Akron, Ohio.

Apr. 10. Chicago Rubber Group, Morrison Hotel, Chicago, Ill.

Apr. 19. Quebec Rubber & Plastics Group, Queen's Hotel, Montreal, Que., Canada. (Joint meeting with SPI and SPE).

Apr. 24. Washington Rubber Group, Cosmos Club, Washington, D. C.

Apr. 26. Rhode Island Rubber Club, Metacomet Golf Club, East Providence, R. I.

Apr. 27. Detroit Rubber & Plastics Group, Spring Meeting, Detroit-Leland Hotel, Detroit, Mich.

May 11. Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Penna.

May 22. Washington Rubber Group, Cosmos Club, Washington, D. C.

May 24-25. S.P.I., Annual National Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

June 14. New York Rubber Group, Summer Outing, Doerr's Grove, Milburn, N. J. (Tentative).

June 15. Akron Rubber Group, Summer Outing, Firestone Country Club, Akron, Ohio.

June 15. Boston Rubber Group, Summer Outing. (Tentative).

June 18-22. A.S.T.M., Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 22. Detroit Rubber & Plastics Group, Summer Outing.

Aug. 7. New York Rubber Group, Golf Tournament, Baltusrol Club, Springfield, N. J. (Tentative).

Aug. 24. Philadelphia Rubber Group, Summer Outing, Cedarbrook Country Club, Philadelphia, Penna.

Sept. 3-7. American Chemical Society, 75th Anniversary Jubilee Meeting, New York.

Sept. 5-7. Rubber Division, A.C.S., Commodore Hotel, New York, N. Y.

Sept. 10-13. Section on Elastomers and Plastomers, 12th International Congress of Pure and Applied Chemistry, New York, N. Y.

Oct. 5. Detroit Rubber & Plastics Group, Fall Meeting, Detroit-Leland Hotel, Detroit, Mich.

Oct. 19. Boston Rubber Group, Fall Meeting, Somerset Hotel, Boston, Mass.

Oct. 19. Akron Rubber Group, Mayflower Hotel, Akron, Ohio.

Oct. 23. Washington Rubber Group, Annual Banquet, Cosmos Club, Washington, D. C.

Oct. 26. New York Rubber Group, Fall Meeting, Henry Hudson Hotel, New York, N. Y.

Nov. 16. Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Penna.

Dec. 14. Boston Rubber Group, Xmas Party, Somerset Hotel, Boston, Mass.

Dec. 14. Detroit Rubber & Plastics Group, Xmas Party, Detroit-Leland Hotel, Detroit, Mich.

Dec. 14. New York Rubber Group, Xmas Party, Henry Hudson Hotel, New York, N. Y.

To Reactivate Ordnance Plant

U. S. Rubber Co. has signed a contract with the Corps of Engineers of the U. S. Army to reactivate the Kankakee, Ill., ordnance works for the manufacture of high explosives. Reactivation has begun under the supervision of the company's Naugatuck Chemical Division. Initial plans call for the employment of 600 persons with initial production to start on or about June 1. U. S. Rubber operated the Kankakee plant from April 1, 1944, until production of explosives was discontinued in late 1945.

Form Adhesives Subcommittee

The Manufacturing Chemists' Association, New York, N. Y., recently formed a Resin Adhesives Technical Subcommittee to work with the armed services and Federal agencies in receiving new government specifications in this field. Members of the subcommittee are: R. P. Hopkins (Rohm & Haas); Leonard Repsher (Bakelite); and John F. Corwin (Koppers). Appointment of the subcommittee is in anticipation of increased requirements by the armed services for various special-purpose adhesives.

ACS RUBBER DIVISION HOLDS SATISFACTORY MEETING IN WASHINGTON

The 58th Meeting of the Division of Rubber Chemistry, American Chemical Society, was held at the Hotel Shoreham in Washington, D. C., on February 28 and March 1 and 2. Official registration was recorded at 642, and the meeting was considered satisfactory in all respects. It featured the presentation of 28 technical papers, a special symposium on "Current Rubber Problems," a business session, a luncheon-meeting of the 25-Year Club, the divisional banquet, and the usual liberal entertaining by suppliers. In addition, an interesting Ladies' Program was held for the first time.

Activities got under way on Wednesday noon, February 28, with the luncheon-meeting of the Division's 25-Year Club. E. R. Bridgewater (DuPont) was chairman of the meeting, with Harry L. Fisher (National Research Council) handling local arrangements. In opening the meeting, Mr. Bridgwater paid tribute to Mr. Fisher's handling of the luncheon, and then introduced the following new members: Amos Oakleaf (Phillips Chemical), L. M. Baker (General Tire), Waldo Semon (Goodrich), W. J. O'Brien (Seamless Rubber), Sam Tanney (Tanney-Costello), and Leo Dete (Carlisle Tire).

Members of 30-35, 35-40 and with over 40 years of experience in the rubber field were asked to stand and take a bow. The oldest from point of service in the field was W. E. "Bill" Kavenagh (Goodyear-Windsor), who has been in the rubber industry for over 50 years. In a short talk, Mr. Kavenagh said he "would do it all over again." Bruce Silver, chairman of the committee appointed some time ago to determine the proper function of the club and to lay out a course of action, reported that the committee was still deliberating, and again emphasized that suggestions from members would be welcomed by the committee.

It was also announced that the club now has approximately 330 members and that a luncheon-meeting would be held in New York in the Fall during the 59th Meeting of the Rubber Division, with A. A. Somerville (Vanderbilt) acting as chairman. Earl B. Busenberg (Goodrich) is permanent secretary-treasurer of the club.

Symposium on Current Problems

The technical sessions began on Wednesday afternoon, February 28, and all of the scheduled papers for the three-day meeting were presented. Abstracts of all these papers were published in the February, 1951, issue of RUBBER AGE. The official meeting was opened by Chairman J. H. Fielding (Armstrong Rubber), who expressed the Division's thanks to the Washington Rubber Group, which acted as official host, and the Division's gratitude for the remarkable number of papers on the program in view of the short period of time between the 57th and 58th meetings. The 57th meeting was the so-called International Rubber Meeting which was held in Cleveland, Ohio, on October 11-13, 1950.

One of the highlites of the program was the special Symposium on Current Rubber Problems prepared by the Washington Rubber Group. The symposium included the following talks: "The Government Rubber Program," by E. G. Holt, Rubber Division, National Production Authority; "Preparedness in Rubber," by Arthur Wolf, chief, Rubber Division, Defense Production Authority, and "The Army's Need for Rubberlike Materials," by Warren Stubblebine, Research Director, Chemicals and Plastics Section, Research and Development Branch, Office of the Quartermaster General. Mr. Holt substituted for the scheduled speaker, Earl W. Glen, who recently resigned as Deputy Director of the NPA Rubber Division and who was to have talked on "Synthetic Rubber, Past and Present." Mr. Holt was given very short notice for the preparation of his talk and did his usual commendable job.

In his talk, Mr. Holt explained the reasons for the government's current rubber program, emphasizing that the principal aim was "the provision of ample supplies of finished rubber goods for the use of the American public at reasonable prices." He pointed out that the government's declared policy is for operation of business by private enterprise and that the tempering of this policy in recent years with respect to the synthetic rubber industry was dictated by considerations of national security. This same reasoning applies to current control over rubber consumption, he said.

Mr. Holt also reviewed the statistical position of rubber during the past few years, both natural and synthetic, and then launched into a comprehensive discussion of the amended M-2 order, including the hows and whys of its necessity and functioning. He stated that in connection with natural rubber, it would be helpful if rubber manufacturers would use the types and grades produced by small-holders and remillers to the fullest extent possible, since this would aid the stockpiling of estate grades by the government. He then reviewed the natural latex situation.

The concluding portion of Mr. Holt's talk was devoted to the 1951 outlook. For the year as a whole, he said, there will be more new rubber for civilian use, in absence of a general war, than was used for all purposes in 1949. Considering the overbuying that occurred in 1949, he added, there is little reason to expect that Federal rationing or other drastic steps will be necessary "if there is proper public cooperation." As for the price of natural rubber, he expressed the belief that the price is now past its peak, and that lower prices are in store, although much depends on the buying policy followed by the government.

Wolf on Preparedness

Mr. Wolf, the second speaker at the symposium, described some of the work done at the National Security Resources Board in regard to assaying "preparedness in rubber" under hypothetical conditions. The rubber activity of the NSRB has since been transferred bodily to the Defense Production Authority. Once the NSRB was firmly organized, the approach to the rubber problem was crystallized in two major questions: (1) Do we have the capacity to produce the rubber items needed by the military services and the war-supporting civilian economy during an all-out five-year war period? (2) Do we have the raw materials to sustain the necessary rate of production during an all-out five-year war emergency? The steps taken to determine the answers to these two questions were outlined by the speaker.

Although Mr. Wolf obviously could not reveal all of the steps taken, he did state that an industry task force finally devised a system whereby all current 25 tire producers could report their capacities on a common basis and, even more important, developed a system of factors which would allow a quick calculation of the change in capacities resulting from a change in the tire production pattern. The necessary action has already been taken by the Munitions Board, according to the speaker, to correct conditions which the task force report indicated needed improvement.

Mr. Wolf then compared our present position in rubber with that of the pre-World War II position, when we were almost wholly dependent on natural rubber. Now, he stated, we have a proven synthetic rubber industry and the know-how to make adequate rubber products from synthetic rubber for at least 80% of our total rubber requirements. He expressed confidence that this percentage can be further increased in the near future. In concluding, he pointed out that an increase in synthetic rubber usage of only 10% would decrease the nation's stockpiling requirement for natural rubber by 50%, a dollar saving that can be measured in the hundreds of millions of dollars at current rubber prices.

The Army's Need for Rubber

The final speaker at the symposium, Dr. Stubblebine, who is also chairman of the Washington Rubber Group, presented the requirements of the Army for rubberlike materials, and reviewed the work in progress directed at finding these materials to solve specific problems. Because it is not possible to earmark rubber items for use under a given set of climatic conditions, he said, all equipment must be designed for successful operation from —65° to 135° F. He explained that items intended for tropical use might encounter temperatures below zero during airborne transit, indicating that the Army needs rubber items which, when out of use, can be stored at temperatures from —80° to 160° F.

Listing four low-styrene modifications of the standard GR-S, ranging from 5 to 15 parts of styrene, Dr. Stubblebine said that with few exceptions these types, or blends of them, fulfill the requirements of non-oil resistant rubber for military purposes, and it was doubtful whether further research will result in anything but minor improvements. Among general problems facing the Army outlined by the speaker were those relating to tires and tubes, seals and gaskets, coated fabrics, insulation and tape, and hose and belting.

With regard to oil-resistant rubbers, Dr. Stubblebine stated that he had no particu-

lar progress to report in the form of selected polymers, but added that work was being done on the sulfur polymers, the fluorocarbons, hydrogenated butadiene and some copolymers, the silicones, and some new types of nitrogen compounds. To sum up his talk, he said that basically what the Army needed was "a rubber with the low-temperature performance of the silicones, the oil resistance of Thiokol or neoprene, the workability and general properties of natural rubber, and the availability of GR-S."

Business Meeting Held

The business session of the Division was held on Thursday morning, March 1, with Chairman Fielding presiding. Mr. Fielding stated that F. W. Staveley (Firestone) had been selected as counselor of the Division, with A. M. Neal (DuPont) as associate counselor. He stated that letters of thanks had been received from both Dr. A. Van Rossem and Dr. R. Houwink in connection with the International Rubber Meeting held in Cleveland last Fall.

In connection with a report from the Auditing Committee, Mr. Fielding stated that the treasury of the Division is in fair shape, but in a fluctuating position from year to year, that the Executive Committee had decided that Division dues will not be increased for the time being, and that a new bookkeeping system is being adopted by the Division treasurer.

It was also reported that the program for the meeting of the Division at the Hotel Commodore next Fall will feature five symposiums, and that papers for all of these symposiums had already been received. D. E. Jones (American Hard Rubber) is chairman of the local arrangements committee for the Fall Meeting. The Membership Committee, headed by J. Kirschner (Dryden Rubber), reported that total membership is currently 2,053, consisting of 1,756 regular and 297 associate members. A moment of silence was observed for two members who had died since the Cleveland meeting, H. B. Morse (Endicott-Johnson) and L. T. Wilson (American Wringer).

The Nominating Committee, of which J. N. Street (Firestone) is chairman, reported the following slate for consideration: *Chairman*, Waldo Semon (Goodrich); *Vice-Chairman*, Seward Byam (DuPont) and John Ingmanson (Whitney Blake); *Secretary*, C. R. Haynes (Binney & Smith); *Treasurer*, Amos Oakleaf (Phillips Chemical). Nominations for directors from local groups to serve two-year terms included the following:

Connecticut, S. M. Boyd (U. S. Rubber) and R. H. Dudley (Whitney Blake); *Detroit*, G. M. Wolfe (Sharples Chemicals) and H. W. Hoerauf (U. S. Rubber); *Northern California*, J. A. Sanford (American Rubber) and R. A. Claussen (Pioneer Rubber); *Philadelphia*, T. J. Gorman (Quaker Rubber) and C. A. Bartle (DuPont); *Rhode Island*, F. W. Burger (Kleistone Rubber) and H. L. Ebert (Firestone); *Southern Ohio*, G. H. McFadden (Ohio State) and Paul Powers (Battelle Memorial Institute); *Washington*, Gerald Reinsmith (Ordnance Dept.) and H. L. Fisher (National Research Council). Directors of all other local groups still have one-year periods to go.

Other Events of Interest

The Divisional Banquet was held on Thursday evening, March 1, at the Shoreham, with approximately 590 members and guests in attendance. Chairman Fielding expressed special thanks to the members of the local arrangements committee and introduced various people seated at the head table. He also announced that William C. Geer had been selected as the 1951 Goodyear Medallist, and that Dr. Geer would present his Goodyear Lecture at the Fall Meeting in New York. The entertainment which followed the banquet was among the best the Division has ever witnessed at these affairs, with many of the songs and skits especially written around the rubber industry.

The special Ladies' Program held during the meeting attracted a number of participants. It included luncheon at the Old Club in Alexandria, followed by a tour of historical areas; a concert by the National Symphony Orchestra, with Leopold Stokowski conducting; various sightseeing tours of Washington; tea at the Hotel Mayflower with the wife of the Chinese Ambassador among the hostesses, and a fashion show luncheon at the Shoreham Hotel. Based on the success of the Washington activity, it is probable that similar programs will be provided for the ladies at future meetings.

In connection with the Washington meeting, a special radio program was broadcast over Station WOL on Tuesday evening, February 27, many of the interviews conducted being devoted to divisional activities. Among those participating in the broadcast were Chairman Fielding, Secretary Haynes, and Norman Bekkedahl (Bureau of Standards).

A meeting of Subcommittee XII on Crude Natural Rubber of A.S.T.M. Committee D-11 on Rubber and Rubberlike Products was held at the Shoreham Hotel on Tuesday afternoon, February 27. Mr. Bekkedahl, who is chairman of the subcommittee, presided at the meeting, with R. G. Seaman (*India Rubber World*) acting as recorder. A full report on this meeting will appear in our next issue.

Committee on Local Arrangements

As indicated above, all activities at the 58th Meeting of the Division went off smoothly and with precision. Credit for this is due to the Committee on Local Arrangements, which was headed by Mr. Bekkedahl as general chairman, with Dr. Stubblebine as adviser. Chairmen of the various committees included the following:

Registration, T. A. Werkenthin (Bureau of Ships); *Finance*, R. E. Harmon (Connecticut Hard Rubber); *Banquet*, I. T. Cox, Jr.; *Publicity and Printing*, T. R. Scanlan (Gates Rubber); *Hotel Arrangements*, R. D. Stiehler (Bureau of Standards); *Ladies' Program*, Ethel Levene (Bureau of Ships). Some 20 other members of the Washington Rubber Group also participated in activities as members of these various committees. A vote of thanks is due them all.

COLLYER CITES U. S. PROGRAM ON RUBBER PURCHASE CONTRACTS

The government's announced intention to enter into fixed-price contracts with natural rubber producers, or "into a rubber price cartel with rubber growing areas," was scored recently by John L. Collyer, president of B. F. Goodrich Co., who contended that entrance into such agreements "would simply legalize and perpetuate much of the gross inflation now present in the crude rubber market."

Expressing his views in a letter to Eric Johnston, Economic Stabilization Administrator, Mr. Collyer stated that "the current inflationary force in the natural rubber market is that of fear-buying of stocks, mainly for strategic purposes, as nations bid against each other." He said that in 1951 world supply of new rubber would be by far the largest in history—2,800,000 tons—while world consumption needs for both military and essential civilian products this year are 2,175,000 long tons.

Rubber Situation Improving

"It is our conviction that the world rubber supply situation is not nearly so serious as has been stated and is improving so rapidly that a much lower price for natural rubber will result in a few months," Mr. Collyer said.

Urging that Mr. Johnston call a meeting before March 14 at which "informed government and business people may join to consider facts to appraise them realistically and to stimulate action," Mr. Collyer said current estimates show a world surplus of more than 600,000 long tons of rubber this year after all military and civilian needs have been met. In fact, he emphasized, a lower natural rubber price definitely will result, provided that the nation does not become involved in a war with Russia, that price agreements are not entered into and that the stockpile of natural rubber already accumulated is realized to be adequate.

Mr. Collyer pointed out that the present world market price for natural rubber is about 80 cents a pound, a gain of nearly 340 per cent since Jan. 1, 1950. The total cost of natural produced by "reasonably efficient" growers is about 10 cents a pound delivered in the United States, while the average total cost of all producers of natural is "probably not in excess of 16 cents a pound," he contended. Furthermore, Mr. Collyer said, new types of synthetic rubber have been developed and production is on the upswing.

No. Calif. Group Holds Meeting

Approximately 35 members and guests of the Northern California Rubber Group attended the March 1 meeting held at the Elk's Club in Berkeley, Calif. Principal speakers of the evening were E. R. Stowall and F. Gonsalves, both associated with the San Francisco, Calif., office of the Wage and Hour Division of the Department of Labor. After a brief discussion of the new wage stabilization regulations by Mr. Stowall, the two speakers answered questions from the floor.

PANEL DISCUSSION ON RUBBER FEATURES NO. CALIF. MEETING

As reported in the February issue of RUBBER AGE, the January 25th meeting of the Northern California Rubber Group, held at the Elk's Club in Berkeley, Calif., featured a panel discussion on technical rubber problems. The following questions and answers were among those discussed by the panel:

Question—How is the proper cure determined for a large article where it is necessary to use a long time at a low temperature to affect the cure?

Answer—If it is possible to cut samples from various sections of the article, the modulus and swell are a very good indication of the state of cure. Thermocouples inserted in the stock are good but are not too accurate. Per cent of combined sulfur is a good test as is the T-50 test for natural rubber.

Question—Which side of a mill is the proper side to load?

Answer—It is the custom to load on the bull gear side, but it actually does not make a great deal of difference.

Question—Compare rayon and cotton as used in tires.

Answer—Both make excellent tires. Rayon is stronger and therefore makes a lighter tire. Rayon also produces less heat build-up.

Question—Where is nitrogen used in rubber compounding?

Answer—It is used as a blowing agent for foam rubber.

Question—Compare the bonding of natural rubber and GR-S to steel.

Answer—Natural rubber makes the best bond because it is stronger. The GR-S bond is probably two-thirds as good because of the low tear resistance of GR-S. Actually, the bonds are about equal, but the GR-S itself fails before the natural rubber. It might be a good idea to bond a layer of natural rubber to the metal and then add the GR-S cover.

Question—What is the best surface for adhesion to metal?

Answer—Actually, the best surface is a polished surface. It is essential that any surface be clean. Where a hard rubber base is to be used, a machined surface is good as it adds strength to the mechanical bond.

Question—Should water always be circulated through the rotors of a banbury?

Answer—Yes, especially on a new banbury to prevent the journals from expanding and damaging the bearings.

Question—What items are important in reproducing the results of an ozone test?

Answer—The most important is the ozone concentration which must be kept constant at the test concentration. This should be done with a constant rate of air circulation. The samples to be tested should have a uniform conditioning period—for example, 10 hours at 100° F., to allow the blooming of protective agents.

Question—What are the good spacers for rubber stocks?

Answer—Holland cloth and polyethylene. Silicone-treated paper is excellent in the laboratory but as yet, it has not been evaluated in the factory.

Question—How can you keep Silene EF from settling in Neoprene AC cements?

Answer—If the cement has been properly made and the Silene still settles, there is not much you can do. It is thought that the neoprene has received the benefits of the Silene during the processing so that the loss due to settling is not too important. This settling of pigments is an old problem, especially with sulfur in natural rubber cements used for tire re-capping work where it is sometimes possible to make hard rubber with the small amount of cement remaining in the bottom of the drum.

Rubber Film for Atomic Tests

Reed Laboratories of Akron, Ohio, is presently producing a rubber hydrochloride film as thin as .0001-inch for use in atomic research throughout the United States, Canada and the Union of South Africa. E. G. Reed, head of the laboratories, perfected the process of manufacturing the hydrochloride film in March of 1949. At that time, the film found use as a wrapping for fruit. The film is now used in so-called "alpha detection" by atomic scientists. The machine on which the sensitive rubber hydrochloride material is stretched is now being patented. The company reports that orders are being received from many of the atomic research centers in the United States. Typical of these is a recent order for 200 square feet of the rubber hydrocarbon film of .0002 inch density.

Rubber Issue Raised at Trial

The case of William W. Remington, former Commerce Department employee who was charged and convicted of having lied in denying under oath that he ever was a member of the Communist party, raised the question of a garbage-into-rubber formula which was discussed in some quarters during World War II. The Government contended that Mr. Remington had passed this formula to a Soviet agent. Rebuttal witnesses, however, stated that the formula was "fairly common gossip" and a "big joke" around the War Production Board. The witness also stated that as far as he knew, the garbage-into-rubber formula never was classified material under the WPB. Government witnesses had stated that the formula was "chemically and technically successful in producing gasoline," an intermediate product in the manufacture of synthetic, and that a "secrecy order" was put on the process in the summer of 1942. The jury was told by government witnesses that the formula was the work of a New Jersey inventor, J. W. Jean, and that Mr. Remington had attended meetings of the board's planning committee at which the process was discussed.

DETROIT GROUP HEARS GRESHAM TALK ON POLYACRYLIC POLYMERS

The February 16th meeting of the Detroit Rubber and Plastics Group held at the Hotel Detroit-Leland in Detroit, Mich., featured an address by Dr. T. H. Gresham, director of organic chemicals research for the B. F. Goodrich Chemical Co. at Brecksville, Ohio. Dr. Gresham spoke on "Polyacrylic Polymers." Dr. Gresham observed that early in World War II, the possibility of using polyacrylates as a substitute for rubber came to the attention of the Goodrich Company.

In the course of an intensive research program on the behavior of these acrylate polymers, S. T. Semegen discovered that the soft, thermoplastic polymers could in effect be vulcanized. This discovery of a means of curing the polyacrylates led to the development of the Hycar PA rubbers, which have remarkable resistance to the deteriorating effects of heat, light and oils, Dr. Gresham said. It is logical to attribute these special properties of the Hycar PA rubbers to the fact that unlike the structural units in natural rubber and the conventional synthetic rubbers, the polymer molecules of the polyacrylic rubbers are completely saturated and thus offer no point of attack by oxygen, he stated.

The processing and compounding of the Hycar PA rubbers is relatively simple, although the materials and procedures used differ somewhat from those employed for either natural rubber or the other synthetic rubbers. For example, the absence of unsaturation in the Hycar PA polymer molecules makes unnecessary the use of age registers such as are used in the compounding of other rubbers. The ease of processing and unusual physical properties of the Hycar PA rubbers have brought about an increasing demand for them in a wide variety of end uses, the speaker said.

Dr. Gresham then introduced Mr. Bascom of the Hycar Sales Department of the B. F. Goodrich Chemical Co., who showed samples of products made from polyacrylic rubbers. Mr. Bascom also assisted Dr. Gresham in answering questions from the floor.

Firestone to Operate Arsenal

According to the Department of the Army, the Firestone Tire & Rubber Co. has been designated to operate the Ravenna, Ohio, arsenal, starting April 1, 1951. Several months ago, Firestone made a survey of work necessary to reactivate the Ravenna arsenal and rendered an industrial mobilization planning report to the Department of Defense. Since that time, Firestone personnel have been working with Ordnance Department officials in preparing the arsenal for reactivation. Paul Borda, formerly production superintendent of Plant II in Akron, has been named general manager of the Firestone-operated bomb loading plant at Fremont, Nebr. The Ravenna arsenal, during World War II, was one of the largest artillery shell and bomb loading plants in the United States.

KITCHENER RUBBER GROUP HOLDS INAUGURAL MEETING

The Kitchener Rubber Group of the Canadian Institute of Chemistry held its inaugural meeting on February 20 at the tire plant of the Dominion Rubber Co. at Kitchener, Ont., Canada. Technical rubber men located in Kitchener had long felt that the heavy concentration of rubber plants in that city warranted the formation of a technical rubber group to operate under the auspices of the Wellington-Waterloo Branch of the Chemical Institute of Canada.

Finally, the group was formed to cover Stratford, Guelph, Galt, Preston, Elmira and Kitchener. The 65 persons who attended the inaugural meeting decided to hold one meeting per month during the fall, winter and spring seasons. Most of these meetings will be held in Kitchener, with others to be held in Galt and other towns.

The chairman for the inaugural meeting was W. H. Bechtel (Kaufman Rubber). R. Smith (Dominion Rubber) is acting as secretary of the newly-formed group. Speakers at the meeting included John Plumb, vice-president and technical director of the U. S. Rubber Reclaiming Co., Buffalo, N. Y., and John Augenstein, chief chemist of the Buffalo company. Both speakers covered the subject "Reclaimed Rubber."

Mr. Plump gave a timely and interesting talk covering the history of the manufacture of reclaimed rubber, stressing its use and adoption by the rubber industry. The speaker also concentrated on newer manufacturing methods brought about by research carried on during the crucial rubber shortage during World War II. Mr. Plumb illustrated his talk with slides depicting manufacturing procedures at the U. S. Rubber Reclaiming plant in Buffalo. The speaker also discussed the characteristics of today's reclaims in the manufacture of rubber products with relation to the Kitchener area.

Geon 404 Polyvinyl Resin

A new, high molecular weight polyvinyl resin that can be processed without plasticizers has been announced by the B. F. Goodrich Chemical Co., Cleveland 15, Ohio. Called Geon 404, the product has created a whole new range of applications for polyvinyl materials in the fields of structural plastics and wire and cable insulation materials, the company states. Geon 404 is said to have the outstanding electrical, physical, and chemical properties of pure, unmodified polyvinyl chloride, and can be processed into "rigids" on conventional plastic equipment. Rigid vinyl insulation based on Geon 404 is reported to have electrical properties definitely superior to and unattainable with plasticized polyvinyl chloride. The flexural strength, resistance to cold flow and warpage, wear resistance, and light weight of the new rigid makes it suitable for varied containers such as typewriter cases, luggage, instrument covers, etc. Its transparency and color range also fit it for use in structural display.

Cary Named Vice-President

Kenneth B. Cary

Kenneth B. Cary, associated with the Burgess Pigment Co. of Paterson, N. J., since 1949, has been appointed vice-president of the company in charge of the Rubber and Plastics Sales Division. Mr. Cary was graduated from Rensselaer Polytechnic Institute in 1929 with a degree in chemical engineering. Later, he joined the Okonite Co. as a chemist and in 1933 was advanced to the position of chief rubber chemist. In 1938, Mr. Cary joined the R. T. Vanderbilt Co. where he was in charge of sales to the insulated wire and cable industry. In 1945, he became a vice-president of Hamilton Laboratories, Inc. Mr. Cary was next associated with Sharples Chemicals, Inc. He resigned this position in 1949 to join Burgess Pigment's technical service and sales staff for the rubber and plastics industries. It was also announced that John D. McAleer, formerly associated with the Rubber Laboratory of the Okonite Co., and later attached to the New York sales staff of that company, has joined Burgess Pigment as a technical sales representative with headquarters in Paterson.

C.I.C. Plans Rubber Program

The Rubber Chemistry Division of the Chemical Institute of Canada will hold a regional conference at the Walper House Hotel in Kitchener, Ont., Canada, on June 15. A general conference of the Chemical Institute is scheduled to be held in Winnipeg on June 18 to 20. The conference of the Rubber Chemistry Division will be in the form of a morning technical session featuring four technical papers while the afternoon will be devoted to two technical papers and a panel discussion on rubber compounding. The day's activities will be concluded with a banquet and an address by a prominent speaker.

Boston Holds Ski Outing

Approximately 35 members and guests of the Boston Rubber Group participated in the third annual Ski Outing held on February 9 through 11 at Windsor, Vt. Walter Edsall (Goodyear) was in charge of the arrangements for the outing. The group enjoyed fairly good snow conditions.

AKRON GROUP HOLDS SYMPOSIUM ON METHODS OF QUALITY CONTROL

Approximately 420 members and guests of the Akron Rubber Group attended the fourth annual Mid-Winter Symposium held on February 2 at the Hotel Mayflower in Akron, Ohio. The subject of the symposium was "Quality Control by Statistical Methods." A complete report on the symposium, the questions asked and the answers given by a panel of experts, appears elsewhere in this issue.

The technical session, which was held in the afternoon, was followed by a social hour, business meeting and an evening program at which the featured speaker was Herman Hickman, Yale University football coach. The Nominating Committee of the group reported on the selection of candidates for the various group offices in 1951-1952. The following members were nominated:

Chairman, D. F. Belmey (Harwick Standard); *Vice-Chairman*, L. M. Baker (General Tire) and John Brothers (Ohio Rubber); *Secretary*, K. J. Kennedy (Goodrich) and Ted M. Kersker (Firestone); *Treasurer*, Kenneth R. Garvick (Firestone) and V. L. Petersen (Goodyear).

MacLellan Forms Consulting Firm

J. A. MacLellan, formerly associated with the General Tire & Rubber Co., has formed the firm of J. A. MacLellan and Associates as consultants to the rubber and associated industries. The new company will offer services for tires, tubes, camelback and allied products, covering production methods and applications, production flow, layouts, material handling and manufacturing equipment. Special attention will be given to current problems arising out of the use of recently developed curing methods, the company states. The firm is located in the Alhambra Arcade Building in Cuyahoga Falls, Ohio.

Witco Forms Defense Division

Witco Chemical Co., New York 17, N. Y., has formed a Defense Products Division within its organization to coordinate defense efforts throughout the company. The objective of the division is to supply Government agencies with information requested regarding productive capacity, schedule of operations, and personnel available for investigation of new processes and products. This new division will cover all of Witco's manufacturing facilities located throughout the country, and will provide information from one central point covering the company's various activities.

Washington to Hear Cadwell

The March 27th meeting of the Washington Rubber Group, scheduled to be held at the Cosmos Club in Washington, D. C., will feature an address by Dr. S. M. Cadwell, director of the Research and Development Department of the U. S. Rubber Co. Dr. Cadwell will speak on "Rubber and Plastic Combinations".

1950 ELECTRICAL DEVELOPMENTS SHOW USES FOR SILICONE RUBBER

In its annual review of electrical developments, the General Electric Co., Schenectady, N. Y., cited several new and interesting applications of silicone products to electrical equipment which were made during 1950. Among the newer developments was a silicone rubber compound which permits rubber fabricators to mold silicone rubber parts more easily and with improved mechanical and thermal properties. Many parts can be fabricated from it without prolonged oven cure, and it has excellent molding and extrusion properties after only a five-minute warm-up.

Because of the outstanding hot tear strength of the silicone rubber, parts with undercuts can easily be removed from molds; and, being neutral in color, stock can be colored for product-identification purposes for individual fabricators. Fabricated parts obtained with General Electric's new silicone rubber compound have high tensile strength, high elongation, excellent electrical properties, and are serviceable over a temperature range of 550° F. to −85° F.

Mold Release Emulsion

A new silicone mold-release emulsion was produced for use on molds for rubber tires, soles and heels, rubber and vinyl floor tiling, and plastics. This emulsion is diluted and used as a spray on the molds. Because of its stability to heat, hard water, freezing, mechanical agitation, and centrifuging, this emulsion has been engineered to prevent the molded part from sticking to the mold. It will resist temperatures as high as 250° C., does not decompose to produce gases, tarry residue, and build-up—a characteristic that helps eliminate gas pockets, which so often cause rejects.

A new use for silicones was found in the preparation of a solution for treating concrete and cement-block buildings. Known as Stopall, types C and CP, and manufactured by the Stopall Waterproofing Manufacturers, Inc., at Kalamazoo, Mich., the new solution containing silicones is used for keeping water out of concrete and cinder blocks, porous stucco, and sandlime brick. Its use permits oil painting on concrete with lasting results. From 100 to 150 sq. ft. per gallon can be covered.

A new silicone glass molding compound consists of a silicone resin and a glass-fiber filler, and is the first commercially available silicone molding compound. Outstanding heat resistance is the principal feature; it withstands continuous operation at 392° F. It also has high impact resistance and excellent arc resistance, as well as good flow in the mold. It will not support combustion, and tests show it has no toxicity when burned. This new compound is ideally suited for circuit breakers, switchgear, and other parts where resistance to extreme heat and impact is necessary. Its unusual properties offer industrial designers many possibilities for new and better-designed products, according to the company.

Anatomical Model Rubber Brain

A rubber brain that will bounce on the floor without damage has been produced by Educational and Scientific Plastics, Ltd., Croydon, Surrey, England. The firm claims that the brain is anatomically perfect and can be passed around a laboratory or classroom without risk. The firm also manufactures plastic skeletons in regular and miniature sizes for table and classroom demonstrations. The rubber brain and the plastic skeletons will be on exhibit at the 1951 British Industries Fair.

Three new rubber-phenolic molding compounds were developed. Supplementing the earlier wood-flour-filled rubber-phenolic compounds, the new compounds consist of an asbestos-filled, a cotton-flock-filled, and a fabric-filled compound. Each has unusual shock, vibration, and fatigue resistance, plus the characteristics of the filler material. The internal resiliency of these new compounds is derived from their rubber component. The new powders extend the range of impact resistance for thermosetting molding compounds, permitting their use in applications formerly considered impossible for plastics materials.

Drop-ball tests indicate that they have shock resistance five to ten times as great as equivalent conventional phenolic molding powders. The tests also indicate that parts molded from the compounds will withstand severe mechanical abuse after cracking, before complete failure occurs. The outstanding abuse resistance of the rubber-phenolic materials reduces breakage of molded parts in shipping, handling, and assembling. The wood-flour-filled type makes possible the molding of low-cost impact-resistant parts through the use of automatic preforming equipment, rapid molding cycles, and inexpensive cleaning methods.

Wyandotte Plans Research Center

Construction of a new research center and expansion of the research and development activities of the Wyandotte Chemicals Corp. of Wyandotte, Mich., was recently announced. The Wyandotte Research Center will be housed in a functionally engineered two-story structure of modern architectural design to be constructed immediately near the company's administration building in Wyandotte. The center will be approximately a city block long and a half block wide. The new research center will permit a consolidation of Wyandotte's research and development activities and will also enable the company to expand its activities in this line. The installation will be under the direction of Dr. Thomas H. Vaughn, vice-president in charge of research and development. Occupancy is scheduled for mid-1952.

CASING PRODUCTION IN 1950 RISES WELL ABOVE 1949 TOTALS

Production of automotive casings in 1950 totaled 92,749,602 units, well above the 76,368,727 units produced in 1949, according to the Rubber Manufacturers Association. Of the total 1950 production, 78,621,811 were passenger casings, while 14,127,791 were truck and bus casings. In 1949, 65,140,287 passenger casings and 11,228,440 truck and bus casings were produced.

Automotive casings shipped in 1950 totaled 99,825,537 units, including 84,657,679 passenger casings and 15,167,858 truck and bus casings. In the previous year, 76,517,036 casings were shipped of which 65,076,720 were passenger casings and 11,440,316 were truck and bus casings. Manufacturers' shipments of passenger casings in 1950 reached a new all time high, topping the previous high of 74,109,453 units shipped in 1947.

As of December 31, 1950, there were a total of 3,769,729 casings on hand including 3,032,539 passenger and 737,190 truck and bus casings. These figures compare with December 31, 1949, when 10,638,187 casings were on hand, including 8,903,731 passenger and 1,734,456 truck and bus casings.

Passenger and truck and bus tubes produced during 1950 totaled 80,612,625 units, against the 65,114,220 tubes produced in 1949. In 1950, 84,265,986 tubes were shipped while in the previous year 63,857,701 tubes were shipped. As of December 31, 1950, there were 6,608,314 tubes on hand. At the end of the previous year there were 10,657,161 tubes on hand.

Building Rayon Tire Yarn Plants

North American Rayon Corp., a subsidiary of Beaunit Mills, Inc., plans to build a large plant at Coosa Pines, Ala., for the production of high tenacity viscose rayon yarn for automotive tires and related products. A large rayon plant will also be constructed by Eastern Rayon Mills, Inc., in West Virginia. The Eastern Rayon plant is expected to be in production in June, 1952, and will produce 12,000,000 pounds of tire yarn and tow annually. The Coosa Pines plant is to be constructed on a tract adjacent to the parent company's textile rayon yarn plant. When in operation in about a year it will have a capacity of 27,000,000 pounds of yarn annually.

January Consumption Rises 7½%

New rubber consumption in the month of January increased 7.54% to 103,585 long tons from the 96,319 long tons consumed in December, according to a recent report by the Rubber Manufacturers Association, Inc. Consumption of natural rubber during the month was up 1.28% to 44,857 long tons from 44,290 long tons used in December. Use of synthetic rubber amounted to 58,728 long tons, an increase of 12.88% from the 52,029 long tons used during the previous month. Consumption of reclaimed rubber by the industry was estimated at 32,060 long tons, 10.24% higher than the 29,081 long tons used in December.

Woodrow Joins Hale & Kullgren

W. H. Woodrow

W. H. Woodrow, formerly associated with the Diamond Match Co., has joined Hale and Kullgren, Inc., of Akron, Ohio, as associate and chief engineer. At Diamond Match, Mr. Woodrow was in charge of general plant and process engineering for all the company operations which included plants for pulp and paper products, wooden ware and lumbering as well as match plants. Previously, he was associated with the Monsanto Chemical Co. for a period of nine years. During that time he had responsible supervision of all plant projects, engineering design and economic evaluations for the Plastics Division at Indian Orchard, Mass. Prior to his work with Monsanto, Mr. Woodrow was connected with the Shaw-Box Division of Manning, Maxwell & Moore, Inc., and the Central Paper Co. Hale and Kullgren are engaged in engineering activities including the design and building of machinery and complete processes for the rubber and plastics industries.

Kilbourne Named Research Head

Connecticut Hard Rubber Co. of New Haven, Conn., has announced the appointment of Dr. F. L. Kilbourne, Jr., as technical director of research and development. Dr. Kilbourne, formerly chief chemist of the Xylos Division of the Firestone Tire & Rubber Co., will supervise governmental and industrial research contract activities of the company. He will also direct new product development in the fields of silicone rubber, coated fabrics and vibration insulation.

Named OPS Rubber Branch Chief

Chester F. Connor, formerly associated with the B. F. Goodrich Co., has been appointed chief of the Rubber Branch, Rubber Chemicals and Drugs Division, Office of Price Stabilization. Mr. Connor was formerly sales manager in the Industrial Products Department of Goodrich, with headquarters in Akron. From 1943 to 1946, he served as a consultant in the Rubber Bureau of the War Production Board.

Enlarges Chicago Laboratories

A new 40 x 80-foot, two story wing is being added to the Chicago, Ill., laboratories of the Witco Chemical Co. This addition will provide increased research facilities to accommodate a greatly enlarged staff. On the second floor will be located a research laboratory 33 by 40 feet in size, designed and equipped in line with the latest developments in modern practice. Here developmental work on new products will be carried out as well as general experimental work on organic chemicals, such as esters, stabilizers, metallic soaps, and paint driers. A control laboratory 23 by 40 feet with separate entrance will consolidate the various control laboratories now located throughout the plant. Office space is also provided and the library will be considerably enlarged. The ground level will house an expansion of the Rubber Technical Service laboratory in which carbon blacks, mineral rubber, softeners, processing aids, and waxes will be evaluated, customers' problems investigated, and data developed for incorporation into technical bulletins for the rubber industry. Also included on this floor will be the experimental machine shop and storage space for non-flammable chemicals and rubber compounding ingredients. Total cost of the new wing has not been disclosed by Witco, but is reported to be substantial.

Announces New Exposition Plan

The Grand Central Palace, New York, N. Y., has announced a new "Package Plan" for trade shows and conventions. This new plan includes 153 booths, 51,466 square feet of floor space, two meeting rooms with a seating capacity of 1,600, a registration area, manager's office, press rooms, public address systems, storage space, exclusive elevator service, and a special rate for the summer months. The new plan has been designed to accommodate trade shows which are limited in size. The Exposition Department of Grand Central Palace will assist and advise show managers on developing budgets, decorations, publicity, sources of personnel staff and booth equipment, and will give assistance and guidance in all matters pertaining to the completion of their shows.

Stearic Acids in Powdered Form

Emery Industry, Inc., Cincinnati, Ohio, has announced the availability of all grades of Emersol stearic acids in a new "extra-fine" powdered form. The company states that laboratory screen test results for these new powdered acids show that 99.5% pass through a U. S. No. 30 Sieve (0.0232-inch openings) and 95% through a U. S. No. 100 Sieve (0.0059-inch openings). This is compared to typical material heretofore available of which 96% passes through a U. S. No. 30 Sieve and only 70% passes through a U. S. No. 100 Sieve. The lubricating properties of powdered stearic acids makes them applicable as a mold lubricant and release compound for plastics, rubber, powdered metals, tablets, pellets, etc.

Max Minnig Named to New Posts

Max A. Minnig

Max A. Minnig, formerly sales manager of the Carbon Black Division of the Witco Chemical Co. at Akron, Ohio, has been elected a vice-president of the company in charge of the Carbon Black Division, with headquarters at the company's offices in New York City. He has also been named special assistant to the president on all carbon black matters. Mr. Minnig received his education at the University of Oklahoma where he graduated in 1940. Since World War II, he has been associated with the Continental and Witco Carbon Companies in Amarillo, Texas, as manager of their Gas Department. In August, 1949, Mr. Minnig was appointed sales manager of the Carbon Black Division of Witco, with headquarters in Akron.

Parker Forms Berea Rubber Co.

Parker Appliance Co., Cleveland, Ohio, has announced the formation of the Berea Rubber Co. at Berea, Ky., for the manufacture of aircraft seals and other precision molded rubber products. The 30,000 square-foot plant, to be constructed at a cost of $550,000, is scheduled for full operation within six months. Annual output of the new plant will be valued at approximately $1,500,000 with provision for expanded capacity as needed. The plant will be erected on a 9¼-acre plot located approximately one mile east of Berea. Initial employment will be about 130 persons. Berea Rubber will be operated as an incorporated subsidiary of Parker Appliance.

Dayton Stock Plan Approved

Stockholders of the Dayton Rubber Co., at the recent annual meeting in Dayton, Ohio, approved a common stock option plan which contemplates issuance of option warrants to officers and key employees with respect to 25,000 shares of common stock. Stockholders also approved a three-year extension of the option now held by Lehman Brothers of New York to purchase 20,000 shares of common stock at $18 a share net to the corporation.

NAMES IN THE NEWS

RICHARD L. NEWMAN, formerly associated with Pabco Products, Inc., has joined the Technical Field Service Division, Pigment Department, Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J.

ELLIOT H. SIMPSON, of E. H. Simpson & Co., Inc., has accepted the chairmanship of the Rubber Committee for the 1951 Finance Campaign of the Greater New York Councils, Boy Scouts of America.

C. W. BENDIGO, for the past five years editor-in-chief of *Textile World*, has joined the New Product Development Department of the American Cyanamid Co., New York 20, N. Y., where his principal assignment will be the study of current developments in the field of synthetic fibers.

WILLIAM A. SINGLETERRY, associated with the U. S. Rubber Co. since 1933, has been appointed general manager of the Textile Division, with headquarters in New York City.

ROBERT P. KENNY, chemical sales manager of the B. F. Goodrich Chemical Co., Cleveland 15, Ohio, has been loaned to the National Production Authority in Washington, D. C., where he will organize a new section within the Plastics Section for the distribution and control of plastic materials.

JOHN E. FIELDS, formerly production superintendent of the Continental Rubber Works, Erie, Penna., has joined the New York Rubber Corp., Beacon, N. Y., as assistant factory manager.

D. E. HENDERSON, after an absence of three years during which he was associated with the F. H. Maloney Co. of Houston, Texas, has rejoined Associated Rubber, Inc., Quakertown, Penna., as vice-president and general manager.

EARL F. ARNETT, associated with the Chemical Department of the General Electric Co. at Pittsfield, Mass., since 1940, has been appointed in charge of the Chemical Process Development Section of the Chemical Department with headquarters in Pittsfield.

CHARLES S. FOWLER, affiliated with the textile industry during his entire business career, has been appointed merchandise coordinator of the Textile Division of U. S. Rubber with headquarters at the company's general offices in New York City.

A. G. POSTLETHWAIT, for the past 15 years president of the National Bank and Trust Co. of Erie, Penna., has been elected vice-president of the Lord Manufacturing Co., Erie.

HAROLD W. DELZELL, section manager in the Field Engineering Department of the Tire Division, B. F. Goodrich Co., has been elected president of the Tire & Rim Association, Inc.

ROBERT E. REHM, associated with the statistical quality program at the General Tire & Rubber Co. since February, 1949, has been named manager of the quality control and material conservation programs of the company.

DR. BRUCE S. OLD, associated with Arthur D. Little, Inc., Cambridge, Mass., since 1946, and a director of the company since 1949, has been elected a vice-president of the company.

R. N. GRISWOLD, formerly Cincinnati, Ohio, branch manager for the Pigment Department of the Calco Chemical Division, American Cyanamid Co., has been named mid-central regional sales manager with headquarters in Cleveland, Ohio.

CARL B. BENNETT, formerly associated with the Catalin Corp., has joined the field staff of the Resinous Products Division of Rohm & Haas Co. in the Ohio area.

DALE J. GASCH, formerly director of research for the Graton and Knight Co. at Worcester, Mass., has joined the Queen City Tulatex Corp., Burlington, Vermont, as director of research and chief engineer.

ELIAS M. SALZBERG, prominent Akron rubber broker who is currently undergoing treatment at Johns Hopkins Hospital in Baltimore, Md., as reported in the January issue of RUBBER AGE, has partially recovered his sight.

FRED TWEED, formerly associated with the Martin Rubber Co. of Long Branch, N. J., has rejoined the company as night superintendent after a lapse of seven years.

DR. GILMAN S. HOOPER, associated with the Industrial Rayon Corp. since February, 1949, has been named assistant manager of high polymer research for the company.

JACK H. RINES, who has been associated with the Pioneer Latex & Chemical Co., and its affiliate, Pioneer Industries, Inc., both of Middlesex, N. J., for some time, has been named general sales manager of both companies. He was formerly associated with the B. F. Goodrich Chemical Co.

E. J. THOMAS, president of the Goodyear Tire & Rubber Co., recently received a first prize of $1,500 and an honor medal from Freedom Foundations, Inc., in recognition of his contributions to a better understanding of freedom.

Join Goodyear Chemical Division

I. N. Lanning and J. H. Houlette have recently joined the Chemical Division of the Goodyear Tire & Rubber Co. at Akron, Ohio, prior to assignment at field offices of the division. Mr. Lanning is a graduate of Iowa State College with a degree in chemical engineering. He joined the Goodyear Training Squadron following his graduation from college in June, 1950. Mr. Houlette is a graduate of Northwestern University with a degree in chemical engineering. After two years of military service he joined Goodyear's Production Squadron from where he moved to his present post.

HERBERT E. SMITH, chairman of the board of the U. S. Rubber Co., has been appointed to head the Manufacturing Group of the April Cancer Crusade of the American Cancer Society.

R. L. MCCANN, formerly vice-president of the New Jersey Zinc Co., has been elected president of the company, succeeding HENRY HARDENBERGH, who was elected chairman of the board of directors.

O. E. ISENBURG, field sales manager of the B. F. Goodrich Chemical Co., is attending the 19th Session of the Advanced Management Program at the Harvard Graduate School of Business Administration.

JOHN L. GILLIS, vice-president of the Monsanto Chemical Co., and formerly general manager of its Merrimac Division, has been named general manager of the Organic Chemicals Division with headquarters in St. Louis, Mo. CHARLES H. SOMMER, JR., has been appointed general manager of the Merrimac Division, succeeding Mr. Gillis.

LESLIE M. CASSIDY, formerly president of Johns-Manville Corp., has been elected chairman of the board and chief executive officer of the company, succeeding the late LEWIS H. BROWN. ADRIAN R. FISHER has been elected president, succeeding Mr. Cassidy.

GEORGE L. FENN, formerly secretary and assistant treasurer of Adamson-United Co., has been named vice-president of the company. Mr. Fenn also assumes the duties of assistant general manager.

WAYNE F. ANDERSON, associated with the B. F. Goodrich Chemical Co., has been elected president of the Cleveland-Akron Section of the Society of Plastics Engineers for the 1951 season.

ALBERT M. KAHN, president of the Acme Rubber Mfg. Co. and the Hamilton Rubber Mfg. Co., both of Trenton, N. J., has accepted the chairmanship of the National Division of the 1951 United Jewish Appeal campaign.

J. LUTHER "LUKE" SEWELL, manager of the Cincinnati Reds, has been appointed athletic ball and sporting goods sales promotion consultant of the Sun Rubber Co., Barberton, Ohio.

NBS Constructs New Laboratory

A special laboratory, recently designed and constructed by the Building Technology Division of the National Bureau of Standards, U. S. Department of Commerce, Washington, D. C., is said to eliminate the major difficulties that have in the past led to anomalous results in the accelerated durability testing of exterior covering materials. Developed primarily for studying organic coating materials, such as asphalts, tars, and paints, the new facilities are sufficiently flexible to meet the requirements of most materials exposed to weathering. Automatic control of all functions, and of the temperature and purity of the water within narrow limits, assures uniform operation at all times of the Bureau's laboratory. The 400 square foot floor area is divided into three sections: a central working space and 2 areas enclosed in hoods to house the testing machines. In one hood are six machines built at the Bureau to utilize the enclosed carbon arc as a source of light. The other hood encloses a modified commercial open-drum Atlas Weatherometer, 2 twin-arc Weatherometers, and an Eveready X-1A machine.

U. S. Rubber Textile Specialties

The Mechanical Goods Division of the U. S. Rubber Co. has announced the development and large scale production of a new line of specialties made of both plastic and rubber for the textile mill supply market. The new line consists of nearly 30 types of specialties for yarn carrying operations and textile machinery. Included are such items as quills, spindle bumper tubing, lap winder rolls, sand roll covering, warp compressor roll covering, spinner belts, cop butts, spinning and card room cots, tapered warp spinning tubes, spooler sleeves, and other molded and extruded specialties. Emphasis has been placed on the application of a new plastic material particularly suited for the textile specialty field. Known as "Uscolite," it is said to combine the hardness of plastics with the toughness of rubber. Production facilities for the plastic have been doubled at the division's Passaic, N. J., plant. Sales and technical service for the new specialties will be handled by the Passaic plant Technical Service Department. A new branch office has been opened at 611 W. 5th St., Charlotte, N. C., under the direction of C. F. Cline, Jr., to provide service for southern mills.

Firestone Wheel Plant for Brazil

Firestone Tire & Rubber Co., Akron, Ohio, is planning to set up a new factory in Brazil for the production of about 200,000 car wheels and rims a year. The factory would produce enough to save Brazil around $5,000,000 in foreign exchange, on the basis of present wheel and rim imports. Equipment for the new factory will be imported from the United States at a cost of around $2,500,000. The company has requested Brazil to admit the equipment free of duties, and it was considered probable that Brazil's Congress would agree.

LABOR NOTES

A week-long unauthorized strike by 2,700 of the 3,300 employees of the U. S. Rubber Co. plant at Passaic, N. J., was ended on February 18, when members of Local 217, URW, voted three-to-one to return. The wildcat stoppage took place after the company announced plans to replace men with women at a lower hourly pay rate, the union said. Grievance sessions were scheduled to be held to discuss the matter.

The Mohawk Rubber Co. and Local 6, URW, have signed a five-year agreement aimed at providing full protection for employees. The comprehensive welfare program includes life insurance for the company's 790 employees the cost of which will be paid by the company. The group policy, to be carried with the Metropolitan Life Insurance Co., provides for $3,000 or payments of $54 for 60 months in event of total and permanent disability. There is an additional $3,000 for death or dismemberment by accident. Weekly sickness and accident insurance of $30 for male employees and $25 for female employees is also included. All those with at least 90 days of service with the company will be included.

Under the new agreement, employees have agreed to hospital, medical and surgical coverage. Also covered in the new agreement is a provision for severance pay in lieu of a pension plan. Male workers retiring at 60 will receive a minimum of $65 for each year of employment if retiring with 10 years' service and a maximum of $100 for each year if they have been with the company 36 or more years.

Anderson Rubber Co., Akron, was closed on February 5 by a strike of approximately 100 production workers, members of the URW. A URW spokesman reported the strike was called on the first shift because a new agreement between the company and Local 57 could not be reached. Pickets allowed only management representatives to enter the plant. The strike ended on February 28 when union members reached agreement with the company. Issues settled included piecework rates, arbitration, a guaranteed 40-hour week, seniority, rehiring of four discharged women workers and a wage increase.

Contract negotiations between the URW and the Goodyear Tire & Rubber Co. in Cincinnati, Ohio, continued at this writing. The company and union began negotiations nearly three months ago. Union officials said some progress has been made toward a new contract governing working conditions for more than 25,000 workers in all Goodyear plants. Wages are not involved in the discussions. Under terms of the present agreement, the union cannot ask for higher wages until an agreement on working conditions has been signed. On March 6, URW officials notified Goodyear that a strike might be called at the end of the month if a satisfactory settlement was not reached before that time.

.0017-Inch Vinyl Film Available

Ross & Roberts, Inc., manufacturers of vinyl film and sheeting at Stratford, Connecticut, and West Haven, Connecticut, announce the availability of .0017-inch (1.7 gage) calendered unsupported vinyl film as its most recent accomplishment in an intensive program for developing lightweight films. This is the first time that anyone has been able to offer a .0017-inch calendered unsupported vinyl film on a commercial scale, the company states. In the experimental stage for several months, its manufacture was finally made possible by new developments in calendering techniques and equipment and follows the development last November of a .002-inch (2 gage) product. Of particular interest to the packaging and protective materials fields for both military and civilian applications, this new development makes it possible to enjoy the economy of a thin film while still retaining the advantages of a calendered product. It is available in a variety of colors and widths. Distribution is being handled through Ross & Roberts Sales Co., Inc., 350 Fifth Avenue, New York 1, New York.

Iowa State Management Course

The College of Engineering of the State University of Iowa has announced the twelfth Summer Management Course to be held from June 11 through June 23 in Iowa City, Iowa. Since its inception, nearly 800 representatives of American and foreign industries have increased their understanding of the design and application of the major management techniques. It is an intensive course for factory managers, foremen, industrial engineers, methods and time study analysts, cost accountants and office executives. The areas of production planning, job evaluation, motion and time study, wage incentives, plant layout, quality control, supervisory training, labor relations and legislation, organization and policy and public speaking are included. Communications concerning the course should be sent to J. Wayne Deegan, 122 Engineering Building, State University of Iowa, Iowa City, Iowa.

Expanding Oleic Acid Production

Emery Industries, Inc., Cincinnati 2, Ohio, has announced the emergency expansion of oleic acid production to meet increased trade and Government requirements. This increased production is in the form of a new single-distilled product, Emersol 212 Elaine, which is similar in all respects to Emersol 210 Elaine, except for a 4.0 maximum unsaponifiable and a 96% minimum free fatty acid content for Emersol 212 as compared to a 2.5 maximum unsaponifiable and a 97% minimum free fatty acid content for Emersol 210. This deviation from normal quality will have only minor effect on many finished products, the company maintains. For these cases and where availability is paramount, Emersol 212 Elaine is recommended. Expanded production supplements the production of regular single-distilled, regular double-distilled and premium grades.

ADDITIONAL TECHNICAL PUBLICATIONS OF BRPRA MADE AVAILABLE

Abstracts of some of the recent publications issued by the British Rubber Producers' Research Association are published from time-to-time in RUBBER AGE. These booklets, which cover research work conducted by various members of the BRPRA staff, may be secured by writing the Association at 19 Fenchurch Street, London, E. C. 3, England. Abstracts of some of the more recent publications follow:

The Interaction Between Rubber and Liquids. Part X. Some New Experimental Tests of a Statistical Thermodynamic Theory of Rubber-Liquid Systems, by Geoffrey Gee. (Publication No. 99): The swelling of rubber in a solvent is dependent on the degree of vulcanization of the rubber, and on the nature of the solvent. The present paper carries our understanding of the phenomena of swelling a stage further, and shows that existing theories account only partially for the experimental observations on the swelling equilibrium under various conditions of temperature and extension of the rubber.

The Hydrodynamics of Non-Newtonian Fluids. I., by R. S. Rivlin. (Publication No. 100): A fundamentally new approach to the problem of fluid flow is developed mathematically, and applied to a number of particular problems. The theory predicts the existence of stresses in the fluid of a type not obtained from the ordinary elementary theory of viscous flow, some of which have been observed experimentally. The theory would seem to have applications to rubber and rubber solutions, and may well provide a valuable approach to the interpretation of their visco-elastic properties.

Flow Phenomena in Rubber. I. Flow Curves for Natural Rubber, by L. R. G. Treloar and D. W. Saunders. (Publication No. 102): The understanding of the processing characteristics of rubbers should be assisted by a knowledge of their fundamental flow properties, which can be expressed in terms of the relationship between the rate of flow and applied shear stress. Using a modified form of Mooney viscometer, this relationship is examined experimentally for natural rubber over a range of temperature from 50° to 140°C. The temperature coefficient of flow rate is consistent with the Eyring theory, according to which flow takes place by the movement of relatively short segments of molecular chains.

The Coupling Reaction of Cinnamyl Halides. Meso-$\alpha\beta$-Divinylbenzyl and the Phenylvinylmethyl Radical, by H. P. Koch. Molecular Configuration and Isomorphism in the Meso-$\alpha\beta$-Divinylbenzyl Series, by G. A. Jeffrey, H. P. Koch and S. C. Nyburg. Absorption Spectra of Dicinnamyl and Some Related Compounds, by H. P. Koch. (Publication No. 103): X-ray structure analysis presented by G. A. Jeffrey (B.R.P.R.A. Publication No. 80) revealed the existence of unusually short single bonds separating the double bonds in 1:5-spaced unsaturated systems. Since this anomaly probably also occurs in rubber hydrocarbon, its fundamental cause and chemical significance have been further investigated. The study of the ultraviolet absorption spectra of dicinnamyl and some related compounds (3rd paper of present series) indicates that the anomaly cannot be ascribed to a novel kind of conjugation of double bonds across three single bonds, as was thought at one time.

The course of preparation of the 1:5-unsaturated hydrocarbon dicinnamyl, mainly employed in this investigation, is described in the first paper of the present series. During this preparation, an interesting new hydrocarbon, meso-$\alpha\beta$-divinyldibenzyl, was discovered, whose properties are described in the first and second papers.

The Hydrodynamics of Non-Newtonian Fluids, II., by R. S. Rivlin. (Publication No. 105): The theory developed in a previous paper (Publication No. 100) to describe the flow properties of high-polymer solutions is applied to the problem of flow through a uniform tube of circular cross-section. It is found that the forces existing in the fluid vary over the cross-section of the tube, in contrast to the situation arising in a Newtonian fluid, where they are constant.

Large Elastic Deformations of Isotropic Materials. V. The Problem of Flexure, by R. S. Rivlin. (Publication No. 108): The forces necessary to produce simple flexure in a rectangular block of incompressible highly elastic material, such as rubber, are calculated. The block is bent to form part of a hollow cylinder, and it is found that if no forces are applied to the two curved surfaces, the forces which must be applied to those surfaces which now pass through the axis of the cylinder are equivalent to couples as in the classical case of bending of a thin metal plate. In addition, however, forces must be applied to the two remaining surfaces (those at right angles to the axis of the hollow cylinder) to prevent elongation, and this feature is not covered by the classical theory.

Absorption Spectra and Structure of Organic Sulphur Compounds. Part I. Unsaturated Sulphides. Part II. Disulphides and Polysulphides. Part III. Vulcanization Accelerators and Related Compounds. Part IV. Unsaturated Sulphones, by H. P. Koch. (Publication No. 109): This is a group of four papers dealing with the ultraviolet absorption spectra of unsaturated sulfides and sulfones, of disulfides and polysulfides, and of sulfur-containing vulcanization accelerators. The information obtained is used in the characterization of some of the components of vulcanized rubber, and for settling certain structural problems, such as free-radical dissociation of sulfides, and the tautomeric character of MBT.

The Primary Thermal Oxidation Product of Squalene, by J. L. Bolland and Hilda Hughes. (Publication No. 110): Squalene (a linear polymeric olefin containing six isoprene residues) may be used as a model substance having the same essential chemical structure as natural rubber. In this publication the constitution of the peroxide formed by the interaction of this olefin with molecular oxygen is investigated. Evidence is presented that the first oxidation product is not, as in the case of many other olefins, a monohydroperoxide but a *di*-peroxide: each point of the polyisoprene chain attacked by oxygen results in the incorporation of *two* oxygen molecules, one forming a hydroperoxide group, the other a cyclic peroxide.

Kinetic Studies in the Chemistry of Rubber and Related Materials. V. The Inhibitory Effect of Phenolic Compounds on the Thermal Oxidation of Ethyl Linoleate, by J. L. Bolland and P. ten Have. (Publication No. 111): This publication describes the influence of the detailed structure of phenols on their antioxidant activity. Three types of antioxidant action are distinguished; the largest number of phenols interact readily with the peroxide radicals produced during oxidation of olefins and cut short the oxidation chains, their chain terminating efficiency increasing with decreasing strength of the phenolic hydrogen-oxygen bond. If however the strength of the latter bond becomes either sufficiently weak or sufficiently strong loss in antioxidant efficiency results: in the former case the main bulk of the phenol (e.g. 1, 4 naphtholhydroquinone) is consumed in direct oxidation reactions, while in the latter case the phenol may interrupt but not terminate the oxidation chains.

Ultrasonic Dispersion in Organic Liquids, by A. Schallamach. (Publication No. 112): The velocities of sound in geraniol, di-dihydrocitronellyl ether, castor oil and iso-butyl alcohol were measured at frequencies between 700 and 3,000 kc/s, and at temperatures between +15° and —80°C. At any one frequency, the velocity of sound increases with decreasing temperature at a rate which depends on the liquid and the temperature. In iso-butyl alcohol the temperature dependence is almost linear over the whole range but in the other liquids there is a sharp rise at lower temperatures, and only in this region is there a pronounced frequency effect, the velocity of sound now increasing with frequency. This effect can only partially be explained by the classical theory and is most probably due to the liquids exhibiting shear elasticity towards alternating stresses. The measurements covered temperature and frequency ranges where dielectric relaxation occurs but no connection between the two effects was found.

Throughout 40 years

of rubber reinforcement

MICRONEX

...has been the Old Reliable of Rubber Blacks...used alone, or in combination

• A COLUMBIAN COLLOID •

COLUMBIAN CARBON CO. · BINNEY & SMITH CO.

MANUFACTURER DISTRIBUTOR

MPC (Medium Processing Channel)
STANDARD MICRONEX

◆

EPC (Easy Processing Channel)
MICRONEX W-6

◆

HAF (High Abrasion Furnace)
STATEX-R

◆

FF (Fine Furnace)
STATEX-B

◆

FEF (Fast Extruding Furnace)
STATEX-M

◆

HMF (High Modulus Furnace)
STATEX-93

◆

SRF (Semi-Reinforcing Furnace)
FURNEX

◆

COLUMBIAN CARBON CO.
MANUFACTURER

BINNEY & SMITH CO.
DISTRIBUTOR

High-Lift Conveyor Installed

What is said to be the world's highest lift conveyor was recently installed by the Goodyear Tire & Rubber Co. in a new mine near Waltonville, Ill., a property of the Chicago, Wilmington & Franklin Coal Corp. Constructed of rubber, fabric and steel, the 42-inch wide belt is capable of conveying 1,200 tons of coal per hour up a 3,290 foot slope to a height of 868 feet. The belt moves 625 feet a minute so that a lump of coal deposited on the belt at the bottom of the mine is dumped over the head pulley five minutes and 15 seconds later. Ultimate plans for the mine provide for underground conveyor belts to carry mined coal to a 500-ton capacity surge hopper which feeds the large slope belt. Conveyor belts handle the coal in all operations above ground. To produce the giant conveyor belt, Goodyear used 240 steel cables as a core. Proper troughing characteristics were insured by the use of 23,648 pounds of fabric. The covers of the belt are made of 75,292 pounds of rubber. The belt weighs 89½ tons. Design load of the belt is approximately 90,000 pounds of tension. The entire load, belt and coal (194½ tons) is moved at approximately 7 miles per hour by a 1,500 hp synchronous electric motor driving the head pulley through an eddy current clutch.

Naugatuck Street Rubber Paved

Naugatuck, Conn., the town which lays claim to being the cradle of the rubber industry, has paved Rubber Avenue, one of the main streets in the community, with a combination of asphalt and meltable rubber compound developed by the Naugatuck Chemical Division of the U. S. Rubber Co. Local highway officials expect the new pavement to give at least twice the wear as straight asphalt resurfacing material. It is also expected to reduce maintenance costs. Officials of Naugatuck Chemical point out that the highway will last as long as the surface layer keeps water from seeping to the lower layers. Infiltration of water and subsequent freezing will rapidly destroy a pavement. When the new rubber compound is added to asphalt, elasticity and durability are greatly improved, resulting in a more serviceable, lower cost road, they said.

Join American Resinous Board

Georges F. Doriot, president, and Horace S. Ford, treasurer, of the American Research and Development Corp., have been elected directors of the American Resinous Chemicals Corp., Peabody, Mass. It was announced that American Research has made a substantial loan to American Resinous Chemicals and its related enterprises, with an option to purchase common stock in all companies. Mr. Doriot is also a director and member of the executive committee of the Dewey & Almy Chemical Co. and the Pressed Steel Car Co. Mr. Ford is a director of Godfrey L. Cabot, Inc., Arthur D. Little, Inc., Textron, Inc., and a life member of the Massachusetts Institute of Technology Corp.

TYPICAL CONTRACT AWARDS MADE BY GOVERNMENT TO RUBBER COMPANIES

In keeping with the stepped up national defense program, the number of contracts awarded to rubber manufacturers for basic military rubber supplies is increasing steadily. Typical of the awards made to rubber companies in recent months are those listed below, taken from the Commerce Department releases on national defense contract awards:

Manufacturer-Supplier	*Material*	*Amount of Contract*
Goodyear Tire & Rubber, Akron	Airplane Landing Gear Brakes	$ 74,983,67
B. F. Goodrich, Akron	Airplane Landing Gears	2,281,150.00
B. F. Goodrich, Akron	Misc. Fuel Cells, etc.	120,000.00
Mohawk Rubber, Akron	Tire Repair Materials	168,408.00
Inland Rubber Co., Akron	Truck Tires	229,500.00
Mansfield Tire & Rubber, Mansfield	Truck Tires	235,000.00
Goodyear Tire & Rubber, Akron	Rubber Cushions	51,594.00
Goodyear Tire & Rubber, Akron	Fan Drive Belts	26,520.00
Armstrong Rubber, Conn.	Truck Tires	25,954.00
U. S. Rubber, Los Angeles	Truck Tires	37,770.00
Goodyear Tire & Rubber, L. A.	Truck Tires	86,974.37
Pacific Rubber, California	Camelback	92,800.00
Mohawk Rubber, Akron	Camelback	105,820.00
U. S. Rubber, Detroit	Camelback	35,000.00
Plymouth Rubber, Mass.	Rubber Sheeting	47,288.40
U. S. Rubber, New York	Duck Cloth	59,840.00
U. S. Rubber, New York	Duck Cloth	76,160.00
U. S. Rubber, New York	Cable Assemblies	800,000.00
B. F. Goodrich, Akron	Airplane Wheel Assemblies	65,598.15
Goodyear Tire & Rubber, Akron	Airplane Wheels & Brakes	129,469.00
U. S. Rubber, Indiana	Misc. Fuel Cells	200,000.00
B. F. Goodrich, Akron	Misc. Airplane De-icer Shoes	1,278,258.00
Firestone Tire & Rubber, L. A.	Fuel Cells	179,685.00
Goodyear Tire & Rubber, Akron	Wheels and Brakes	220,395.00
Goodyear Tire & Rubber, Akron	13,200 Tires	997,350.00
Mohawk Rubber, Akron	6,000 Tires	503,040.00
U. S. Rubber, Detroit	6,500 Tires	362,180.00
Seiberling Rubber, Akron	400 Tires	22,440.00
Kelly-Springfield, Md.	1,500 Tires	68,280.00
Denman Rubber Mfg., Warren	900 Tires	41,220.00
Gates Rubber, Chicago	7,400 Gas Hoses	39,673.51
Ace Hose & Rubber, Chicago	2,000 Gas Hoses	39,712.50
Rubbercraft Corp., Conn.	2,825 Pneumatic Rafts	271,708.50
Sponge Rubber Prod., Conn.	Rubberized Hair	44,086.00
Firestone Tire & Rubber, Akron	100,000 Disc Wheels w/Tires	3,662,000.00
Seiberling Rubber, Akron	2,300 Tires and Tubes	36,609.50
U. S. Rubber, Detroit	3,100 Tires	62,560.00
Cupples Co., St. Louis	14,800 Tubes	69,339.00
Kelly-Springfield, Md.	2,300 Tires	32,390.00
Firestone Tire & Rubber, L. A.	11,454 Tires and	216,162.37
	10,645 Tubes	25,414.80
B. F. Goodrich Co., L. A.	6,575 Tires and	108,795.85
	5,615 Tubes	25,211.35
B. F. Goodrich Co., Ohio	1,190 'plane Tube Assemblies	29,012.65
U. S. Rubber Co., New York	33,800 yds. Duck	48,394.00
Goodyear Tire & Rubber, Ohio	Airplane Wheels and Brakes	44,894.00
Firestone Tire & Rubber, L. A.	B-29 Fuel Tanks	1,574,370.00
Goodyear Tire & Rubber, Ohio	B-29 Fuel Tanks	1,562,708.00
U. S. Rubber Co., Indiana	B-29 Fuel Tanks	1,501,815.00
Mansfield Tire & Rubber, Ohio	12,300 Tires	734,459.00
Gates Rubber Co., Colorado	12,000 Fan Drive Belts	129,031.72
Denman Rubber Mfg., Warren	5,600 Tires	78,277.00
Mansfield Tire & Rubber, Mansfield	12,200 Tires	95,754.00
Pennsylvania Rubber, Ohio	1,100 Tires	40,766.00
Goodyear Tire & Rubber, Akron	8,890 Tires and 7,350 Tubes	215,595.30
B. F. Goodrich, Los Angeles	4,060 Tires	35,533.80
U. S. Rubber, Indiana	400 Swim Suits	25,000.00
Pacific Rubber, California	Camelback	92,800.00
Mohawk Rubber, Ohio	Camelback	105,820.00
U. S. Rubber, Detroit	Camelback	35,000.00

Smith Elected Sun President

Thomas W. Smith, Jr., formerly general manager of the Sun Rubber Co. of Barberton, Ohio, and one of the founders of the company, was named president and treasurer at a director's meeting on February 8. Mr. Smith succeeds the late John T. McLane as president. He began his business career as a hardware salesman in his home town of McKeesport, Penna., while still in high school. Following attendance at the University of Pennsylvania and Navy duty during World War I, he returned to civilian life to continue in the real estate and insurance business until 1923 when he joined business associates to found Sun Rubber. During World War II, Mr. Smith was a member of the Toy Industry Advisory Committee of the War Production Board and the Office of Price Administration. Other officers named at the director's meeting were: Joseph L. McLane, vice-president; Chester C. Lile, vice-president in charge of production; William R. Lantz, vice-president and director of purchases; Tom B. Roberts, vice-president in charge of sales promotion; Samuel C. Andress, secretary; Walter S. Raymer, Jr., assistant secretary and assistant treasurer. Henry Wadsworth was named director of engineering while Philip Stewart was named personel director. Bernard A. McDermott was named director of art and design. The new organization also lists seven directors, two more than served on the board previously. They are: Thomas W. Smith, Jr., chairman; Joseph L. McLane, Sherwin M. Wylie, Dr. G. L. Howder, Samuel C. Andress, J. Paul Farrell and Reed H. Albig.

Goodyear Sets Up Fellowship

A participating fellowship at Textile Research Institute, New York, N. Y., has been established by the Goodyear Tire & Rubber Co. The fellowship, known as the Goodyear Fabric Fellowship, will be for research and general study of the two-dimensional stress-strain properties of airship-type fabrics. Dr. Charles H. Reichardt, who received his Ph. D. in physical chemistry from Princeton University in 1950, will carry out the initial phase of the fellowship work. The fellowship will go on the usual predoctoral basis later. Dr. J. H. Dillon, director of research of the Institute, expects to supervise the work directly.

Baker Develops New Ricinoleates

Baker Caster Oil Co., 120 Broadway, New York 5, N. Y., has developed a new line of metallic ricinoleates. Barium, cadmium, calcium, magnesium, and zinc ricinoleates are available. Samples from pilot plant facilities may be obtained on request. Larger amounts will be supplied for customer experimental production runs if required. Regular production in volume is expected in the near future, the company states. Baker maintains that current study of these ricinoleates indicates that they parallel or surpass the performance of metallic stearates in their many applications.

NEW POLYMERS AUTHORIZED BY OFFICE OF RUBBER RESERVE

Listed below are types and properties of new experimental GR-S polymers (including GR-S latices) which have been authorized by the Office of Rubber Reserve, Reconstruction Finance Corporation, since publication of those in our previous issue. Procedures for the distribution and sale of these polymers will be found in our October, 1945, issue. Normally, experimental polymers will be produced only at the request of the consumers and 20 bales (one bale weighs approximately 75 pounds) of the original run will be set aside if possible for distribution to other interested companies for their evaluation. The 20 bales when available will be distributed in quantities of one or two bales upon request to the Sales Division of Rubber Reserve or will be held for six months after the experimental polymer was produced unless otherwise consigned before that time. Subsequent production runs will be made if sufficient requests are received to warrant them.

X No.	*Polymer Description*
X-610 GR-S	Same as X-577-GR-S, except shortstopped with sodium dimethyl dithiocarbamate and sulfur. Mooney viscosity 52 ± 7; stabilized with 1.25% Stalite.
X-611 GR-S	Butadiene/styrene charge ratio 75/25 adjusted to give 20 ± 1% bound styrene on the finished polymer; activated with cumene hydroperoxide or diisopropylbenzene hydroperoxide or Diox 7 or mixtures; polymerized at 41° F. Emulsified with Dresinate 214; shortstopped with DNCB. Mooney viscosity 52 ± 6; stabilized with 1.25% PBNA or BLE.
X-612 GR-S	Same as X-577-GR-S, except emulsified with Dresinate 731, Mooney viscosity 52 ± 6; stabilized with 1.25% Stalite.
X-613 GR-S	Same as X-577-GR-S, except emulsified with potassium Nilox.
X-614 GR-S	Same as X-577-GR-S, except activated with paramethane hydroperoxide and emulsified with Dresinate 731.
X-615 GR-S Latex	Same as Type V GR-S Latex, except butadiene/styrene charge ratio is 50/50.
X-616 GR-S	A mixture of 50 ± 2 parts of high abrasion furnace black, Statex R, and 100 parts GR-S type polymer polymerized at 41° F. Sodium lignin sulfonate, Dresinate 214 and lignin used in carbon black slurry make-up. Butadiene/styrene charge ratio 71.5/28.5; activated with cumene hydroperoxide or diisopropylbenzene hydroperoxide or mixture of both. Emulsified with Dresinate 214 and K-ORR soap; shortstopped with DNCB. Shortstop Mooney viscosity 36 ± 5, ML-4 at 212° F. stabilized with 1.5% PBNA.
X-617 GR-S Latex	Same as the latex from which X-565-GR-S is coagulated, except Mooney viscosity on the contained polymer 80-90 MS-4; pH 10.0-11.0.
X-618 GR-S	Same as X-611-GR-S, except polymerized at 47-50° F.
X-619 GR-S Latex	Same as X-547-GR-S latex, except Mooney viscosity of contained polymer 160 ± 10 ML-4. Concentrated to 60.0% minimum solids.
X-620 GR-S	Butadiene/styrene charge ratio 71/29; activated with cumene hydroperoxide or diisopropylbenzene hydroperoxide; polymerized at 41° F. Emulsified with K-ORR soap; shortstopped with sodium or potassium dimethyl dithiocarbamate. Mooney viscosity 55 ± 7 ML-4; stabilized with 1.5% ELGI; glue-acid coagulation.
X-621 GR-S Latex	Polybutadiene latex polymerized by the Type V latex technique; shortstopped with tetramethylthiuram disulfide. Solids content 50.0% minimum.
	Please Note Changes Made in the Following Experimental Polymers
X-577 GR-S	Activated with cumene hydroperoxide or diisopropylbenzene hydroperoxide or Diox 7 or mixtures. Mooney viscosity 52 ± 6.
X-592 GR-S	Activated with cumene hydroperoxide or diisopropylbenzene hydroperoxide; shortstopped with sodium or potassium dimethyl dithiocarbamate; stabilized with 1.25% Stalite.

NOTE: The above new polymers are experimental only and the Office of Rubber Reserve, Reconstruction Finance Corporation, does not make any representations or warranties of any kind, express or implied, as to the specifications or properties of such experimental polymers, or the results to be obtained from their use.

Growth of Farm Tire Market

The farm tire market has grown so rapidly during the last decade that many large farms now buy more tires annually than truck fleets in industrial cities, according to Joseph E. Powers, truck and bus tire sales manager of the B. F. Goodrich Co. Mr. Powers, in a recent address before the Maryland, Delaware & Virginia Farm Equipment Association in Baltimore, Md., stated that agriculture is a larger business than steel and transportation combined. Practically 100% of the more than 4,000,000 tractors now in use on American farms are rolling on rubber tires. One in every three trucks is used in some agricultural capacity and one in every five automobiles is owned by a farmer, he said. Mr. Powers further stated that the general rubber supply situation is far better today than during the World War II crisis. Even if the worst should happen and the nation's supply of natural rubber should be cut off, the output from American synthetic rubber plants should be able to meet all military requirements and all essential civilian transportation needs.

Geon Resin Sealing Tapes

Two new types of sealing tape utilizing Geon polyvinyl resin, a product of the B. F. Goodrich Chemical Co., have been introduced by the Technical Tape Corp., New York, N. Y. The first, a water and moisture proof tape, was designed primarily for use in sealing packages for overseas shipment. A 60,000,000 yard tape contract has been received by Technical Tape from the Ordnance Department of the Army covering this type. An expenditure of $1,000,000 is represented by this record order. The pressure sensitive, waterproof cloth tape is also available for civilian use in olive drab, white and black colors. The other new sealing tape, called "Break-Pruf," is designed for heavy duty operations such as wrapping coils of wire, metal strips, banding plate glass, rods, tubing, lumber, etc. Consisting of a paper backing reinforced with longitudinal glass fibers, the tape has excellent tear resistance, tensile strength, and adherence stability.

Symposium on Abrasion and Wear

An International Symposium on Abrasion and Wear will be held in November, 1951, at Delft, Holland, by the Rubber-Stichting. According to present plans, the first day of the symposium will be devoted to the general aspects of abrasion and wear, including the problems connected with friction and lubrication. The second day of the symposium will be devoted to specific problems—the abrasion and wear of rubber, plastics, metals and other materials. Scientists from many countries will present papers at the symposium. Dr. R. Houwink is president of the Organizing Committee for the symposium with Dr. H. C. J. de Decker as secretary. Persons desiring additional information on the symposium are requested to apply to the secretary at P. O. Box 66, Delft, Holland.

Giant Airplane Fuel Cell

The airplane fuel cell illustrated herewith is the largest ever manufactured by the B. F. Goodrich Co., Akron, Ohio. Designed for the B-47 bomber, the cell has a

capacity of 2,500 gallons. It is seven feet high, eight feet, one inch in width, and eight feet, nine inches long. In contrast, the sump cell at lower left, also used in the fuel system of the B-47, holds only two gallons.

Conference on Radioisotopes

Radioisotopes in industry will be the subject of a five-day conference to be held at the Case Institute of Technology in Cleveland, Ohio, on April 2 to 6. Case Institute is presenting the conference in cooperation with the Atomic Energy Commission. The purpose of the conference, which is the first of its type for industry, is to encourage a safe and wider industrial use of radioisotopes, according to John R. Bradford of the Radioisotopes Laboratory at Case, director of the program. Exhibits by manufacturers of radiation detection equipment which will demonstrate the equipment available on the commercial market and exhibits prepared by the Atomic Energy Commission will be added features of the conference. The conference fee of $50 includes the ten regular sessions of the conference and tickets to a dinner and five luncheons. Copies of the program and registration forms may be obtained by writing to John R. Bradford, Radioisotopes Laboratory, Case Institute of Technology, Cleveland 6, Ohio.

Forms Resins-Plastics Department

The Chemical Plants Division of the Blaw-Knox Co., Pittsburgh, Penna., has announced the formation of a Resins and Plastics Department with Arne Olson, associated with the company since 1930, as manager. The new department will specialize in the design and construction of complete plants for the manufacture of all types of synthetic resins, including alkyds, phenolics, urea, melamine, polyvinyl chloride, and polystyrene. Mr. Olson was graduated from Carnegie Institute of Technology with a degree in chemical engineering in 1930. He has been closely associated in an engineering and development capacity with the rapidly expanding line of Blaw-Knox chemical and process equipment.

Urge Hainan Rubber Development

The "Overseas Chinese" in Southeast Asia were recently reported to have been receiving letters from Communists urging them to invest in the industrial development of China, and particularly in the Peiping regime's program for expanding rubber production on Hainan Island. Although Communist China is estimated to have more than 500 small factories engaged in rubber manufacturing, the country is almost completely dependent on imports of raw rubber and auxiliary chemicals for such manufacture. According to the Peiping magazine "New China Monthly," there were only five small factories in China capable of making automobile tires. Six million rubber saplings are scheduled to be planted on Hainan Island this year, according to official reports from Canton. It was estimated last fall that subtropical Hainan was producing rubber at the rate of 250 to 300 tons annually, but the mainland press has said that the output could be increased to 90,000 tons in five years.

Goodrich Develops New Army Tire

A new "high flotation" tire designed to keep military trucks from bogging down in mud or sand has been developed by the B. F. Goodrich Co., Akron, Ohio. The new design stems from three years of research and development conducted by the Ordnance Corps of the U. S. Army and the rubber industry, cooperating through the Ordnance Advisory Council of the Tire & Rim Association. The new tire is said to be better suited for low pressure operation needed for mud and sand service than the World War II general purpose tire which found the going rough in some terrain. Once out of mud or sand, the air pressure may be increased to the normal level to permit operation of the high flotation tire on paved roads like conventional military truck tires. A special tread design, outgrowth of wartime experience with tires designed for desert service, provides traction for general purpose trucking, yet digs less into sand and mud. Among the U. S. Army vehicles to use the new tire are the jeep, ¼, 2½ and 5-ton trucks.

ECA Allots $700,000 to Indonesia

The Economic Cooperation Administration has alloted $700,000 in United States aid funds to the Republic of Indonesia to cover initial costs of consulting, advisory and engineering services to be performed by the J. C. White Engineering Corp. of New York, N. Y. This is the latest in a series of U. S. aid projects which are being launched to assist the Indonesian Government in certain aspects of its efforts to restore and advance the public health services, aid the small rubber planters, develop resources and assist small industries throughout the country. The program of assistance to Indonesia has been developing over the past six months, since the Congress last July authorized ECA to extend its program to the countries of Southeast Asia. Burma, Thailand and Indo-China are also receiving U. S. technical and economic assistance.

LOS ANGELES HEARS MILLER ON APPLYING RUBBER TO AIRCRAFT

The technical session of the February 6th meeting of the Los Angeles Rubber Group held at the Mayfair Hotel in Los Angeles, Calif., were addressed by Charles M. Miller, materials engineer of Northrup Aircraft, Inc. Mr. Miller spoke on "Rubber in Aircraft—Design Requirements and Applications."

In his address, Mr. Miller stated that the weight of rubber used in military aircraft may be as much as 10% of the dry weight (without fuel) of the airplane with tires and fuel cells accounting for over 80% of the rubber used. Packings, gaskets and seals account for 3 to 7% of the rubber used.

All the rubber (natural, synthetic and silicone) that is used in aircraft is procured to rigid specifications to achieve three basic objectives: (1) assurance of serviceability; (2) consistency of quality between sources, and (3) consistency of quality between successive orders. The specifications in most general use are the AMS (Aeronautical Material Specification) which are written by the aircraft specialists with the cooperation of the rubber manufacturers. They are a compromise between manufacturing and design, as a specification is worthless if a manufacturer can not work to it.

The AMS Division meets twice yearly, with much inter-meeting correspondence being handled by the New York Office of the parent organization, the Society of Automotive Engineers. Therefore, an AMS specification can be handled from "need for" to "publication" within six months.

The rubber compounds now being used for fuel seals and gaskets show marked swell and shrinkage characteristics when used in fuels which vary in aromatic content, Mr. Miller said. Fuel resistant O-rings have been demonstrated to shrink so excessively after alternate aromatic fuel immersions and drying that at the peak of a swell cycle the volume would be less than when originally installed. This problem is so current that a special Air Force-Navy-Industry meeting has been held in Washington to discuss this matter.

The rubber compounds now used in the petroleum base hydraulic oil applications are fairly satisfactory. The use of the new non-flammable hydraulic fluids, however, will cause a tremendous problem and a challenge to the polymer and packing manufacturers.

The interpretation of deterioration of rubber parts due to oxidation or so-called "weather-cracking" is a current and potent problem. Test methods to evaluate this phenomenon and the criteria for inspection and replacement, in relation to serviceability, are not well defined. Much work is needed here, Mr. Miller observed.

Mechanical fastening is best for rubber parts, with a slow draw-up method (screws) employing adequate back-up strips heading the list. Drive riveting is the most deleterious with the other methods falling in between. Cold cementing is satisfactory if the process is closely controlled and the rubber stock is so compounded, and the joint is carefully designed. Vulcanizing or hot cementing are both satisfactory if the part is correctly designed.

Non-pressurized door seals rely upon the resiliency of the rubber compound to achieve the seal. Design requirements are: (1) 20% bulb compression; (2) weather resistance; (3) tear and abrasion resistance; (4) low compression set; (5) low temperature flexibility (—65° F.), which involves the change in load required to compress the seal, and (6) installation method.

A tubular door seal, 0.50-inch outside diameter, designed for 20% compression may vary from 0% (gap of 0.048-inch) to 58% compression, when the extremes of tube, door and frame manufacturing tolerances are considered. This example is given to emphasize the importance of meeting the specification tolerances as well as the compounding requirements.

The Thiokol bent loop method for determining low temperature brittleness (ASTM D-736), as required by most specifications, has been discontinued by the ASTM. Of several proposed replacement test methods, Young's Modulus Testing (ASTM D-797) is finding the most favor. A compound will change from rubber-like to plastic-like characteristics at a modulus of 10,000 psi. This modulus value can be used as the criterion, with compounds compared as to the temperature at which a modulus of 10^4 is reached.

Since the modulus test does not thoroughly evaluate the low temperature characteristics of a compound, a series of four methods has been recommended: (1) Young's Modulus; (2) Brittleness (ASTM-D-746); (3) Durometer Hardness Change; and (4) Gehman Test (ASTM-D-1053). It appears now that the AMS specifications will eventually require Young's Modulus Testing, as soon as test equipment is available and values become established. Until this test method or a better one is in use, the AMS specifications will continue to require the bent look method (ASTM-D-736).

The future compound for use in aircraft should be capable of being extruded, molded and calendered. It should also have: (1) Tensile strength of natural rubber; (2) Tear strength of natural rubber; (3) Elongation of natural rubber; (4) Low compression set; (5) Weather resistance of silicone rubber; (6) Oil and fuel resistance better than Buna-N compounds; (7) Low Temperature: Flexibility at —100°F; (8) High Temperature: Capability of withstanding continuous exposure to +550° F. with no more than 10% reduction in mechanical properties; (9) Cementability to itself, metals or plastics without pressure or heat curing.

Hold Hearings on Belt Line

The Senate Judiciary Committee of the State of Ohio is presently holding hearings on the proposed belt conveyor system linking Lake Erie and the Ohio River. The committee is holding hearings on a bill that would give conveyor belt lines the same rights as public utilities. Riverlake Belt Conveyor Lines, Inc., an organization formed to plan and construct the belt line, recently announced that its Engineering Council had completed engineering work on the project. The Engineering staffs of more than 24 companies, including the Goodyear Tire & Rubber Co. and Hewitt-Robins, Inc., have participated in the Council's work. Major opposition to the construction of the belt line comes from the railroad companies who see in the proposed system elements of unfair competition.

NEW YORK CITY
HOME OF
AMERICAN AIRLINES FLIGHT PERSONNEL
AA
Hotel Empire
600 cheerful rooms, private baths—radio & television
Leslie L. Paul, Managing Director
Ample parking—Adjacent garage
Near every exciting point of interest.
Air-conditioned Dining Room & Cocktail Lounge.
AT THE
GATEWAY TO TIMES SQUARE
BROADWAY at 63rd ST.—JUST OFF WEST SIDE HIGHWAY
OPPOSITE New York's New TELEVISION CITY

COMMITTEE D-11 ON RUBBER REVIEWS 1950 ACCOMPLISHMENTS

A review of the accomplishments of Committee D-11 on Rubber and Rubber-like Products of the American Society for Testing Materials in 1950 indicates that the committee prepared many methods for determining the chemical and physical properties of rubber products and issued numerous specifications.

Among the many methods approved, those for the Chemical Analysis of Rubber Products (D-297) are very important and a major accomplishment in 1950 was the complete rewriting of these methods. Additional definitions have been given and a more usable form has been embodied; and of considerable significance along standardization lines is the coordinating of procedures with those of the Federal Specifications Board. These methods are arranged into three separate procedures: *A*. Complete Procedure. *B*. Direct Determination of Rubber Hydrocarbon. *C*. Copper and Manganese Determination in Crude Rubber.

Method *A* is intended for general use in the determination of some or all of the major constituents of a rubber compound. It is designed primarily for use with natural rubber compounds, but many parts of it may be applied to synthetic elastomer compounds or mixtures of these with natural rubber compounds. Method *B* is a procedure for the direct determination of natural rubber hydrocarbon by quantitative oxidation with chromic acid and measurement of the acetic acid thereby produced. Method *C* includes specialized procedures for the determination of copper and manganese in crude natural rubber only.

Important revisions of the methods of Testing Rubber Insulated Wire and Cable (D-470) were also made. They cover the determination of ozone concentration by either the present chemical analysis method or by direct measurement with an ozonometer. The latter has the advantage of permitting continuous readings of the ozone concentration during test.

Named to New Zealand Post

A. W. Larson, associated with the Goodyear Tire & Rubber Co. since 1937, has been named managing director of the Goodyear Tyre & Rubber Co. of New Zealand, Ltd., at Wellington, N. Z. Born in Akron, Mr. Larson was graduated from the University of Akron and joined Goodyear in 1937 as a member of the office squadron. For a year he was secretary to the vice-president of the Tire Sales Division, then joined the Crude Rubber Division in 1939. A short time later he went to Singapore as warehouse manager for the Goodyear Orient Co. From 1942 to 1945, Mr. Larson served with the U. S. Army. He returned to Goodyear in 1945 and was assigned to the Sales and Office Personnel Department. In 1947, Mr. Larson joined the Goodyear Export Co. as manager of its Personnel Department. Two years later he was appointed to the staff of the Far Eastern Division, later serving with the Australian and Eastern Division until his New Zealand appointment.

Youmans Promoted By Okonite

E. D. Youmans

Okonite Co., Passaic, N. J., has announced the appointment of E. D. Youmans as vice-president in charge of manufacturing and research. Mr. Youmans, previously vice-president and technical director, replaces D. R. Stevens, formerly executive vice-president, who retired from active service on February 1, after 30 years of managing the company's factory operations. Mr. Youmans started with Okonite in 1913, obtaining his chemical and engineering education by attending evening classes at the Brooklyn Polytechnic Institute while working during the day at the Okonite laboratories in Passaic, N. J. Well-known for his activities in the electrical and rubber industries, Mr. Youmans has served on many technical committees of the National Electrical Code, the National Electrical Manufacturers' Association and the United States Army and Navy. He has been active also in technical committees of the American Society for Testing Materials and the American Standards Association, and has served on several government advisory committees.

FPEB 55-Gallon Container

Rohm & Haas Co., Philadelphia 5, Penna., has licensed a number of companies to manufacture the "FPEB" drum, a new 55-gallon capacity container. The package consists of a specially constructed 55-gallon fiber drum equipped with a separate polyethylene envelope. Pinching, undue stretching or other damage to the plastic envelope is prevented by a special kraft paper boot. The open top of the plastic envelope is allowed to overlay the top chime of the drum. A disc of the same or a similar plastic material is placed over the open end after the drum is filled and before the lid is positioned. A full-round sponge rubber gasket is cemented to the underside of the lid, and when the drum is closed this gasket seals the plastic disc securely against the overlay portion of the envelope. Thus, the package may be reopened and re-sealed repeatedly. The container finds use in the shipment of non-corrosive, non-flammable liquids.

CARBON BLACK PRODUCTION RISES 13% ABOVE PRODUCTION IN 1949

According to the Bureau of Mines of the United States Department of the Interior, a total of 1,381,483,000 pounds of all types of carbon black were produced during 1950, 13% over the 1,223,440,000 pounds produced in 1949. Of the 1950 totals, 764,830,000 pounds were of the furnace type while 616,653,000 were channel blacks. In the previous year, 596,071,000 pounds of furnace and 627,369,000 pounds of channel black were produced.

A total of 1,506,736,000 pounds of carbon black were shipped during 1950, of which 837,825,000 were furnace blacks and 668,911,000 were channel blacks. These figures compare with 1949 when a total of 1,127,322,000 pounds of carbon black were shipped, this figure being 34% less than in 1950. Furnace blacks shipped in 1949 amounted to 591,401,000 pounds and channel blacks shipped amounted to 535,921,000 pounds.

Stocks on hand at the end of 1950 totaled 87,185,000 pounds including 21,871,000 pounds of furnace and 65,314,000 pounds of channel. At the end of 1949, there were 212,438,000 pounds in stock including 94,866,000 pounds of furnace and 117,572,000 pounds of channel.

During 1950, 365,697,000 pounds of black were exported of which 121,961,000 were of the furnace type while 243,736,000 were channel blacks. In the previous year, 276,545,000 pounds of black were exported including 89,024,000 pounds of furnace and 187,521,000 pounds of channel.

CCDA to Meet in New York

The Annual Meeting of the Commercial Chemical Development Association to be held at the Roosevelt Hotel in New York City on March 21, will feature the subject, "The Effect of Government Regulations on Commercial Chemical Development." Dr. W. E. Kuhn, manager of the Technical and Research Division of the Texas Co., will act as chairman of the meeting. Highlighting the day's program will be the presentation of the 1951 Commercial Chemical Development Association Honor Award to Francis J. Curtis, vice-president and director of industrial preparedness of the Monsanto Chemical Co. Mr. Curtis, in accepting the honor award, will speak on the subject "The Making of a Manager." Outstanding speakers representing both government and industry will address the meeting.

Postpones Stockholders' Meeting

Plymouth Rubber Co., Canton, Mass., has postponed "for a short while" its annual stockholders' meeting originally scheduled for February 23. The delay results from the fact that officers of the firm are considering two major steps for the company. One is to list Plymouth's stock on the New York Curb Exchange; the other is to adopt the "Lifo" or last-in-first-out method of inventory evaluation. Full reports on these developments were not ready on February 23, necessitating the delay.

FINANCIAL NEWS

U. S. RUBBER SETS NEW RECORD WITH SALES OF $695,755,923

Net earnings and sales of the United States Rubber Company in 1950 were the highest in the company's history, according to the 59th annual report to stockholders released recently by Herbert E. Smith, chairman, and Harry E. Humphreys, Jr., president. Net earnings for the year were $24,657,647, equivalent to 3.5 per cent of sales and $11.04 a share on the common stock, compared with $15,100,072, or 2.9 per cent of sales and $5.62 a share in 1949. This was an increase of 63.3 per cent over 1949 and 6.2 above the previous record year of 1946. Consolidated net sales were $695,755,923, an increase of 34.5 per cent over the 1949 total of $517,439,676, and 19.8 per cent above 1947, the previous record for sales.

The company's plantations in Malaya and Sumatra produced 43 million pounds of rubber, about half of which was shipped in latex form. Production in 1950 was 12 per cent less than the 49 million pounds produced in 1949 due to unfavorable weather, plus strikes and labor shortages in Sumatra and communist-inspired banditry in Malaya. The report said it is believed the communist tide will be held back from the rubber producing areas of Asia. Production for 1951 is estimated at 50 million pounds.

Sales of Dominion Rubber Company, Ltd., the company's Canadian affiliate, increased 23 per cent in 1950. United States Rubber Export Company, Ltd., which handles most of the company's overseas business, had the third highest year's sales on record. Net assets of foreign subsidiaries, before deducting reserves for foreign activities, were $41,560,297, compared with $38,339,709 in 1949.

Federal and foreign income taxes were $31,144,486, compared with $10,434,483 in 1949 before deducting $2,438,814 in unneeded provisions for prior years' taxes. The increase in tax rates in 1950 reduced the company's profit by $7,800,000, although the "excess profits" tax of 30 per cent was effective for only six months. The company also paid social security taxes of $4,619,855, compared with $2,879,954 in the previous year, and state, county, local and other taxes of $9,612,161, compared with $7,835,418 in 1949. Excise taxes amounting to $44,536,935 were collected from customers and paid to the government compared with $33,267,680 in 1949. All taxes, including excise taxes, were up 73 per cent over the previous year.

The financial position of the company was improved during the year. Cash and U. S. Treasury savings notes increased $3,085,796 even after the use of cash to reduce the long-term debt. The long-term debt was reduced by the purchase of $68,000 of debentures of 1967 in the open market in advance of sinking fund requirements. The remaining balance of $15,000,000 due on serial bank notes was paid in 1950.

The balance sheet showed current assets of $280,372,183 against current liabilities of $112,461,434, giving a net working capital of $167,910,749, compared with $167,938,509 in 1949. Receivables increased during the year by $40,063,263, reflecting the increased volume of sales and the higher prices required due to higher costs. Despite increased costs, inventories of finished goods at the end of 1950 were $14,815,740 less than December 31, 1949, as a result of the sales surge in the last half of the year.

Inventories of goods in process, raw materials and supplies, on the other hand, increased $25,116,749. This increase was caused to a large extent by increased costs of raw materials, particularly crude rubber. The inventory of crude rubber at the close of the year was valued substantially below market because of the policy of accounting for inventories on an annual average cost basis.

A total of $207,707,445 in wages and salaries was paid in 1950 to an average of 59,069 employees, excluding those on the rubber plantations, against $179,272,941 paid in 1949 to an average of 56,521 employees. In addition, the company paid pensions totaling $1,390,515 to 2,350 former employees.

Additions to property and plant, including the acquisition of the Paracril plant at Baton Rouge, La., amounted to $15,230,487. Depreciation and obsolescence charged against operations during 1950 amounted to $13,401,668, compared with $13,327,649 in 1949. Disposals and adjustments resulted in an increase in plant investment of $234,684 in 1950 compared with a decrease of $3,866,724 in the previous year.

Seiberling Rubber Co.

For 1950: Net income of $1,815,560, which is equal to $5.26 a share, compared with a net loss of $359,351 in 1949. Net sales in 1950 amounted to $38,321,118, a 51% increase over the net sales of $25,338,774 in 1949. As of December 31, 1950, total current assets of $14,087,591 compared with total current liabilities of $4,639,281, a ratio of 3 to 1. At the end of the previous year, total current assets were $10,209,213 while total current liabilities were $2,154,956. J. P. Seiberling, president of the company, stated that the company did much to "recover from the damaging losses of 1949, and to strengthen our financial structure." This included paying past and current dividends on preferred stocks, and retiring all bank loans.

National Automotive Fibres, Inc.

For 1950: Net profit of $4,779,025, which is equal to $4.80 a share on sales of $76,053,409, against $4,416,675, or $4.43 a share on sales of $64,540,533 in 1949.

GOODYEAR NET AT $35,109,355 AS 1950 SALES SET NEW RECORD

The Goodyear Tire & Rubber Company in 1950 established an all-time record in sales, totaling $845,138,051, P. W. Litchfield, chairman of the board, announced recently. Production in units and tonnage was also the largest in the history of the company, with Goodyear factories processing more than one-seventh of the world's consumption of new rubber.

Consolidated net income increased to $35,109,355, equivalent to $15.62 per share on the common stock, compared with $20,230,520, or $8.40 per share, earned in the preceding year. Last year's earnings were exceeded only once before, in 1946. The 1950 sales eclipsed the war-time peak of $786,722,287 established in 1944 and increased 33 per cent over the 1949 total of $633,505,978.

Adoption of the last-in, first-out (lifo) method of computing costs of domestic and Canadian inventories of rubber had the effect of reducing inventory valuations by $23,791,914 and of reducing consolidated net income for the year by $9,936,609. In addition, a further provision of $5,000,000 was made from income to cover the possible excess cost of eventual replacement of rubber in view of the substantial involuntary liquidation of normal inventories which occurred during the year.

Because of continuing restrictions on the remittance of earnings in certain countries, the year's operations were also charged with $5,573,000, which has been carried to the reserve to foreign investments. This now stands at $19,029,169 after a 1950 charge of $907,000 arising from devaluation of currencies in foreign countries.

Despite the additional charges against income last year, higher costs of operation and substantially higher taxes, income per dollar of sales increased from 3.2 cents in 1949 to 4.2 cents in 1950. Taxes of all kinds—including federal excise, income and excess profits taxes, social security and foreign taxes—totaled $120,614,815 against $76,143,148 the year before.

Goodyear's working capital reached a new high of $289,111,405, an increase of $27,000,000 for the year. The current asset ratio at the year-end was 5 to 1. Capital expenditures for new production facilities last year amounted to $30,000,000, one-third of which was in plants outside the United States. The production of these factories, Mr. Litchfield reported, is being increased to meet the steadily growing needs for the company's products world-wide.

Flintkote Company

For 1950: Net income of $7,703,255, which is equal to $5.83 each on 1,260,435 common shares, compared with $5,825,579, or $4.33 each on an equal number of shares in 1949. Net sales during 1950 totaled $83,879,811, contrasted with $67,815,156 the year before. Current assets as of December 31, 1950, totaled $37,954,887, while current liabilities were $12,541,894. At the end of 1949, current assets were $30,808,048, while current liabilities were $7,613,379.

1950 PRODUCTION AND SALES HIGHEST IN GOODRICH HISTORY

In a preliminary statement on activities of the company in 1950, the B. F. Goodrich Co. reported that sales had increased 40.1% from the previous year. Net sales amounted to $543,312,294 compared with $387,918,386 in 1949, representing the highest volume of production and sales in the company's 80-year history.

After provision for all expenses, including taxes and depreciation, and after providing reserves of $4,000,000 for increased replacement cost of facilities and $5,000,000 for inventories and purchase contracts, net income amounted to $34,708,355, or $24.19 per share of common stock outstanding at year-end after deducting the regular dividend on the preferred shares. The corresponding net income for 1949 amounted to $20,935,738, or $14.36 per share of common stock after providing reserves of $5,000,000. Net income in 1950 on the new stock, after the 3-for-1 split effective January 10, 1951, would have equaled $8.06 per share, the report stated.

The December 31, 1950, domestic inventories of crude and American-made rubbers, including the rubber content of in-process and finished products, has been valued on the Last-In, First-Out (LIFO) basis instead of the average cost method previously used. This change has the effect of reducing net income for the year by $4,462,000 and inventories by $10,377,000. Taxes amounted to $82,416,000, equivalent to $60.27 per share of common stock.

Regular dividends amounting to $1,628,155 were paid during the year on the preferred stock. A dividend of $1.00 per share on the common stock was paid each quarter, and an additional dividend of $2.50 per share was paid at the year-end, making a total of $8,744,175 paid during the year on the common stock.

The preliminary report, signed by John L. Collyer, chairman of the board and president, stated that "During the year 1950 the number of shares of preferred stock outstanding was reduced from 412,031 shares to 212,031 shares by the redemption and retirement of 200,000 shares. The company paid $20,000,000 plus accrued dividends to redeem this stock."

It was also reported that on October 25, 1950, the board of directors recommended to the stockholders that the common stock be split three shares for one. This recommendation was approved at a special stockholders' meeting held on January 3, 1951. Distribution of the additional shares has been made to stockholders of record as of the close of business on January 10, 1951. The number of shares outstanding at December 31, 1950, was 1,367,543. The number of shares outstanding following the stock split was 4,102,629.

Pantasote Company

For 1950: Net profit of $176,514 on net sales of $5,467,903, compared with $34,919 on net sales of $4,167,665 in 1949.

Fisher Scientific Co., Pittsburgh 19, Penna., has developed a Koroseal-covered foam rubber cushion especially designed for use on laboratory stools.

Armstrong Cork Co.

For 1950: Net profit of $12,433,231, which is equal to $8.13 a common share, compared with $10,224,215, or $6.57 a share in 1949. Sales in 1950 totaled $186,766,670, against $163,323,948 in the previous year. Net earnings of Armstrong's companies operating abroad amounted to $506,163 in 1950, against $390,597 the year before; Current assets as of December 31, 1950, totaled $60,842,826, against $49,766,671 a year earlier. Current liabilities increased to $20,275,663 from $12,936,645 and shareholders' investment rose to $105,458,879 from $99,274,873 in 1949. Earned surplus showed a net gain of $3,548,006 and stood at $37,638,434 at the year end. Book value of common stock increased to $56.58 from $52.20 in the previous year.

Mohawk Rubber Co.

For 1950: Net profit of $596,096, which is equivalent to $4.21 per outstanding share of stock and compares with $2.09 for the year 1949. Sales for 1950 amounted to $11,551,554, representing an increase of 38% over the previous year. The percentage of net profit to net sales was 5.16%. Working capital at the close of the year amounted to $2,885,475. Plant additions made in 1950 represent an investment of $540,244. The balance sheet of the company as of December 31, 1950, revealed total current assets of $4,565,120 and total current liabilities of $1,679,644.

Brown Rubber Co.

For 1950: Net income of $1,472,944, which is equal to $3.91 a common share, compared with $1,239,420 in 1949. The net income for 1950 was the largest for any year in the history of the company. Sales also established a new record in 1950, exceeding the previous year by 33%. Cash and U. S. Treasury Certificates on hand as of December 31, 1950, were $1,944,906. Total current assets at the end of 1950 were $2,191,448 and current liabilities were $582,593. As of December 31, 1949, total current assets were $2,116,044, while total current liabilities were $404,550.

Western Electric Co.

For 1950: Net income of $38,646,951, compared with $42,565,511 in 1949. Sales during 1950 amounted to $758,064,000, contrasted with $858,191,000 in the previous year. Western Electric sold $662,049,000 of goods, about 87% of its total production, to member companies of the Bell System (American Telephone & Telegraph and its subsidiaries). Addition of $12,414,000 to the plant brought the total plant investment at the end of 1950 to $333,737,000.

Sheller Manufacturing Corp.

For 1950: Net profit of $4,701,451, which is equal to $4.25 a share, compared with $3,689,811, or $3.30 a share in 1949. Sales in 1950 increased to $42,066,449 from $31,683,070 in the previous year.

GENERAL TIRE SALES AND INCOME SET HIGHS IN 1950 FISCAL YEAR

The General Tire & Rubber Co., Akron, Ohio, in its annual report to stockholders, stated that for the year ended November 30, 1950, net profit amounted to $8,557,616, which is equal to $13.88 per common share. In the year ended November 30, 1949, net profit amounted to $1,014,883, equal to 94c a common share. The gain in earnings was attributed to considerably higher volume and a much better cost-price relationship.

The report shows net current assets at the end of the 1950 fiscal year at $38,891,759, contrasted with $35,021,483 on November 30, 1949. Current liabilities as of November 30, 1950, were $15,263,906, contrasted with $10,910,098 at the end of the preceding fiscal year.

William O'Neil, president and chairman of the board of the company said the company's 1950 volume was the greatest in its history, with net sales at $125,375,737. In the 1949 fiscal year net sales were $92,579,553. Mr. O'Neil said that while it was true that in 1947 the company reported sales of $127,136,242, in that year special brand sales of the Pennsylvania Rubber Co. were included. This year, these sales were transferred to the Mansfield Tire & Rubber Co. in which General Tire holds a 50% interest.

Mr. O'Neil reported that operations of the company's various subsidiaries were "very satisfactory." He said the "consolidation of the Pennsylvania unit's tire and tube manufacturing operations with those of the Mansfield unit proved a wise move." The 1949 Pennsylvania operation resulted in a loss, but the 1950 operations resulted in a substantial profit.

In addition to the company's present foreign operations, plants are now being planned in Tel Aviv, Israel, two more in Europe and one in the Far East, Mr. O'Neil said. These are in addition to affiliated factories in Mexico, Chile, Venezuela, Portugal, South Africa, Germany and Switzerland.

It was also reported to stockholders that the company's new method of manufacturing GR-S, yielding 22% more rubber with the same amount of materials and present equipment, has been offered to the government under certain payment conditions. The Canadian government has already accepted the plan.

Dewey & Almy Chemical Co.

For 1950: Net profit of $1,936,056, which is equal to $6.05 each on 319,949 shares of common stock. The 1950 earnings were the highest in the company's history and practically double those of 1949. Earnings per share in 1949 totaled $3.05 on an equal number of shares. Net sales reached a new high for the eighth consecutive year, totaling $22,258,857, an increase of 37%. The company's sales have shown a great increase since 1940, when they amounted to just over $5,000,000. The company's financial condition was materially strengthened in 1950. Cash and U. S. Government securities increased from $2,098,221 to $2,710,666 while working capital rose from $5,016,805 to $6,168,161.

Goodyear Electrostatic Air Filter

Development of a new type of air filter for forced draft hot air furnaces and air conditioning systems has been announced by the Goodyear Tire & Rubber Co. The product is described as a self-charging electrostatic air filter which takes useful advantage of the dielectric properties of polyethylene and other plastic materials. The material used in the filter is a thin film shredded into a porous mass. This material when exposed in a current of air picks up an electrostatic charge to thereby attract and retain the finest of dust, soot or smoke particles suspended in air. Company officials stated that this new filtering principle differs from filters now in use in that the latter collects foreign particles only by impingement to their adhesive coated structures, the dirt remaining on the air entrance side of the filter. The Goodyear air filter can be cleaned and fully regenerated by immersion in water containing a detergent and replaced immediately without any deteriorating effects.

Expanding Chlorine Production

Stauffer Chemical Co., New York 17, N. Y., has announced the installation of additional equipment at its plant in Niagara Falls, N. Y., in order to increase the production of chlorine. This was the second expansion program announced by the company within the past year. About a year ago, Stauffer authorized an expansion program designed to increase capacity by 50%. This program will be completed within the next few months. The latest expansion program, completion of which is expected by January, 1952, will bring total plant capacity to well over 100 tons daily. Substantial increases in the demand for chlorine, which has kept this commodity in tight supply in recent years, prompted the second expansion program. Chlorine production facilities at the Stauffer plant in Henderson, Nevada, have also been enlarged within recent months.

Hycar Latex-Impregnated Fabric

Loren Products Corp., New York, N. Y., has introduced a new tough, long wearing non-woven fabric that looks, feels and absorbs water like chamois, but which is said to wear three times longer than the natural product. Called "X-Lint", the material has been impregnated with Hycar latex, a product of the B. F. Goodrich Chemical Co. The product, according to the Loren company, is unaffected by ordinary household chemicals and solvents and leaves no lint. Impervious to salt water, it is the first practical "chamois" for marine use.

Martin Completes Alterations

Martin Rubber Co. has announced the completion of alterations at its plant in Long Branch, N. J., which will enable the company to manufacture extruded goods of all types including tubing. The company states that it is now in a position to handle orders for all types of extruded shapes.

Toy Balloon Flies Ocean

A toy balloon, manufactured by the Pioneer Rubber Company of Willard, Ohio, recently made a trans-oceanic flight all by itself. Starting from Elizabeth, New Jersey, the balloon, still inflated, landed in England. Like hundreds of such balloons given to children by Louis Kolker's toy store, located in Elizabeth, New Jersey, this "Qualatex Balloon" was imprinted with the store's name and address. Mr. Kolker learned of the balloon's amazing flight when he received a picture postcard from Mrs. A. Tearse of 5 Melampus Street, Walney Isle, Barrow-in-Furness, England, stating: "A balloon was picked up here on Saturday, October 14th, so thought you might be interested to know how far it had flown. It was still blown up." On the picture side she had marked an "X" on the promenade of the town, indicating the balloon was found there. The chief meterologist of the Weather Bureau at Newark Airport said the flight was possible because of the prevailing winds.

Rocket Assembly Safety Clothing

Safer, more comfortable protective clothing has been developed for the men who handle liquid rocket propellants for the U. S. Air Force, the Air Materiel Command Headquarters at Wright-Patterson Air Force Base announced recently. Typical of the dangerous materials handled by these men is a propellant composed of red fuming nitric acid and aniline. The latter, often colorless and odorless, is highly toxic, readily absorbed through the skin, and deadly if taken into the blood stream in sufficient quantities. The protective clothing consists of a cover-all and hood assembly made from vinyl-impregnated Fiberglas, butyl rubber boots and vinyl-cotton gloves, plus a plastic visor in the hood for greater visibility. The assembly is cooled by one of two devices, an air-ventilated harness or an outer shell of mercerized cotton which is saturated with water and cools by evaporation.

Heyden Resorcinol Plant Explodes

An explosion of unknown origin partially destroyed the resorcinol plant of the Heyden Chemical Corp. at Garfield, N. J., on February 26th. Only one employee was injured. Prompt action by the Heyden plant fire department and the Garfield Fire Department had the fire under control in 25 minutes. According to Heyden officials, much of the equipment can be salvaged and the loss is covered by insurance. Production schedules on other products are not affected in any way by the temporary loss of the resorcinol plant, acording to John P. Remensnyder, president of the company. NPA authorities have assured Heyden that reconstruction will be expedited, he said.

Processing of Reclaimed Rubber

The Winter, 1951, issue of *Taylor Technology*, house organ of the Taylor Instrument Companies, Rochester 1, N. Y., features an article by John S. Plumb, vice-president of the U. S. Rubber Reclaiming Co., entitled "New Reclaimed Rubber Process Demands Automatic Temperature Controls." In the article, Mr. Plumb explains the part temperature controls play in the automatic regulation of a new continuous process for the devulcanization of reclaimed rubber at the Cheektowaga, N. Y., plant of U. S. Rubber Reclaiming. The new reclaiming process involves the high temperature and pressure treatment of powdered rubber with chemical reagents in a new "reclaimator" designed by the company. Mr. Plumb states that this new method has reduced total transit time through the plant from three days to one hour as compared with conventional processes.

Thixon Bonding Agents Offered

Dayton Chemical Products Laboratories, Inc., of West Alexandria, Ohio, has renamed its line of bonding agents used in the production of rubber-to-metal bonded assemblies. Now called "Thixon" bonding agents, they are suitable for use with polymers including natural rubber, GR-S, neoprene, acrylonitrile stocks and Butyl. The new name will replace formula numbers previously used by the company. Subscripts will be added to the name to differentiate between formulas used for different applications. Dayton Chemical Products has also announced that "Thixon" bonding agents will be distributed in the East and Mid-West areas by the Harwick Standard Chemical Co., Akron, Ohio.

Named Boston Hose President

John M. Bierer, recently named executive vice-president and general manager of the Boston Woven Hose & Rubber Co. of Cambridge, Mass., has been elected president of the company succeeding the late J. Newton Smith. Mr. Bierer will continue as general manager of the company. Harold B. Richmond, a director and member of the executive committee of the company, has been elected first vice-president. Marshall B. Dalton, president of the Boston Manufacturers Mutual Fire Insurance Co., has been elected a director of the firm. Complete details of Mr. Bierer's career appeared in the February, 1950, issue of RUBBER AGE.

Author's Correction

T. A. Werkenthin, author of the article "The Extensive Utilization of Rubber and Plastic Elastomers in the United States Navy, which appeared in the January, 1951, issue of RUBBER AGE, has called our attention to a minor error. Mr. Werkenthin was cited as Principal Materials Engineer in Charge of the Rubber and Plastics Section of the Bureau of Ships, Navy Department, Washington, D. C. Actually, Mr. Werkenthin is Principal Materials Engineer of the Elastomers Branch of the Section.

Toothed Gilmer Timing Belt

U. S. Rubber Co., New York 20, N. Y., has developed and started large scale production of a rubber and fabric belt with teeth which it considers the most outstanding advancement in power transmission during the past 50 years. Known as the Gilmer Timing Belt, it will attain speeds up to 16,000 feet per minute. Perfected after 12 years of research by the L. G. Gilmer Division of U. S. Rubber,

the belt is similar in appearance to a flat belt except that it has regularly spaced teeth along its inner surface which engage in corresponding grooves in the pulleys. It can be manufactured in any desired size and in a variety of materials to suit specific applications. In addition to its anti-slip characteristic and precision timing, the new belt will not stretch. It will operate on fixed centers without take-up adjustments. Since it needs no initial tension it has unusually high efficiency with extremely low bearing pressure, the company states. The belt requires no lubrication. It is unusually compact and speed ratios up to 30:1 are possible. The belt may be used as a functional part such as a synchronized conveyor as well as for transmitting power.

Witco Wittalls Tallate Driers

Witco Chemical Co., New York, N. Y., has developed a new line of tallate driers under the trade name "Wittalls." The company states that the new driers are not to be considered solely as substitutes for naphthenates, but as high quality driers in their own right. Tallates were used as substitutes for naphthenates during World War II, but have been vastly improved because of better raw materials and more expert manufacturing procedures, according to the company. Wittalls combine excellent drying power and light color in uniform, controlled products. Their reliable metal content, stability to storage, freedom from objectionable odor, and wide range of compatibility with paint vehicles assure their acceptance as regular driers comparable to naphthenates and octoates. Though slightly more viscous than naphthenates, in almost all formulations they can be substituted pound for pound, the firm maintains.

NSRB Approves Tax Writeoffs

The National Security Resources Board has granted permission to a number of companies to apply five-year amortization to new facilities. This means that in calculating taxable income, the companies can write off all or part of the cost of the new plant at the rate of 20% a year for five years. The approved certificates cover two kinds of expansion: (1) facilities for expanding output of basic raw materials; (2) facilities for producing items directly or closely related to military end-items. The granting of a certificate does not obligate the company to go ahead with its plans. Some projects, for instance, will fall through because the backers can't arrange the necessary financing. The certificate also does not grant the company tax amortization benefits for 100% of the amounts indicated. Companies producing a strictly military item may get as much as 100% amortization. Among the companies who have been granted the NSRB certificate are: Quaker Rubber Corp., Philadelphia, Penna., for rubber goods at $1,218,553; Parker Appliance Co., Cleveland, Ohio, and Berea, Ky., for rubber rings, gaskets and seals at $512,721; and Raybestos-Manhattan, Inc., Stratford, Conn., for clutch plates at $359,007.

Rubber-Wool Combat Boot

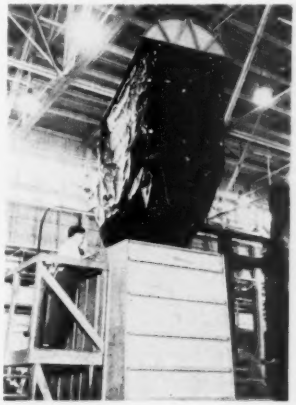
The U. S. Marine Corps has awarded a contract to the Hood Rubber Co., division of the B. F. Goodrich Co. at Watertown, Mass., for 40,000 pairs of cold weather boots. Designed by Salvatore Gianola, an employee of the Naval Clothing Depot in Brooklyn, N. Y., the boot is made of two layers of rubber with wool insulation packed between. The boot is designed to be worn with just one pair of socks of medium thickness. If cold water seeps down from the top of the shoe, the boot will heat the water to normal skin temperature inside of an hour. The boot also has a reinforced toe to permit combat men to push themselves along the ground as they crawl. The outer sole is knurled for effective traction on the ground. The Marine Corps announced that eventually this new boot will replace all the shoepacs now in use by the Corps. The Army plans to obtain a supply of the boots and give them extended tests.

Russia Short of Carbon Black

In a recent meeting between members of the carbon black industry and officials of the Office of International Trade of the U. S. Department of Commerce, it was stated by OIT members that Russia and her satellites are desperately short of carbon black. The purpose of the meeting, called by OIT, was to discuss export controls on carbon black. The United States makes about 90% of the world's supply. Because of the shortages in Russia, shipments of carbon black are being watched closely. Shipments to Russia or her satellites are forbidden under recently imposed export controls. However, OIT officials are concerned about trans-shipments, that is, shipping to one country and that country re-shipping to Russia.

Goodyear Air Force Fuel Cell

Goodyear Tire & Rubber Co., Akron, Ohio, is presently producing a new type of fuel tank for the United States Air Force. Intended for use in the B-36 bomber, the unit is composed of a Pliocel nylon fuel cell weighing less than .085 pounds per square foot which fits into a metal shell. The photograph depicts the nylon fuel cell



being fitted into the metal shell of the giant new fuel tank. The tank holds 3,000 gallons. The tank has passed "slosh" tests at the Air Materiel Command, Dayton, Ohio, and has undergone calibration tests at the Fort Worth Division of Consolidated Vultee Aircraft Corp. where the B-36s are built.

Butyl Puncture-Proof Tube

Firestone Tire & Rubber Co., Akron, Ohio, has announced the development of a new, light-weight puncture-proof butyl tube which seals itself instantly when punctured. The tube is made in three layers with two puncture sealing elements under the tread. The inner layer is a special soft butyl, which will flow around a nail or similar sharp object to prevent loss of air. An intermediate layer of especially compounded butyl resists tearing or enlargement of puncture holes. The tough, heat-resisting outer layer of butyl provides superior air retention, the company states. Unique in design and construction, the new tube is said to be the first light-weight puncture-proof tube to be made available to motorists.

Rubber Torpedo Retriever

Sun Rubber Co., Barberton, Ohio, has been awarded a contract by the Department of the Navy for the manufacture of a bellows type rubber torpedo retriever. Sun had engaged in research and development on the new retriever which was recently tested by Navy officials. Similar to a collapsible drinking cup and performing in much the same manner, the torpedo retriever floats the torpedo head, thus enabling it to be retrieved for re-use. The mold used to produce the torpedo retriever weighs 7,000 pounds, and is one of the largest ever installed in Sun's plant.

CANADIAN NEWS

The Canadian courts have cleared the way for Thomas D. MacDonald, Combines Commissioner for Canada, to make his long-awaited report to the Federal government on results of an investigation into an alleged rubber combine in Canada. The rubber companies had objected to the filing of the report stating that Mr. MacDonald was not the person named in the Combine Investigation Act to make the report and therefore had no jurisdiction to do so.

The court's judgment upheld a previous decision handed down on November 27, 1950. This decision was appealed, and the appeal court held that there was nothing in the act which barred the commissioner from making a report upon an investigation which he himself had not conducted.

The investigation was authorized more than three years ago by Fred A. McGregor, who was then the commissioner. Mr. McGregor resigned on January 1st, 1950, and was succeeded briefly by Ian M. MacKeigan, who carried on the probe, during the brief time he was in office. Mr. MacDonald finished investigation and wrote the report. The rubber companies claimed that only Mr. McGregor could legally submit the report.

Joseph Sedgwick was counsel for the rubber companies with the exception of Goodyear Tire & Rubber Co. of Canada Ltd., which was represented by J. J. Robinette. T. N. Phelan acted for the commissioner. Those seeking the injunction were:

Acton Rubber Ltd., Barringham Rubber and Plastics Ltd., Cambridge Rubber Ltd., Canadian Allis-Chalmers Ltd., Canadian General-Tower Ltd., Dominion Rubber Co. Ltd., Dunlop Tire & Rubber Goods Co., Firestone Tire and Rubber Co. of Canada Ltd., B. F. Goodrich Rubber Co. of Canada Ltd., Goodyear Tire & Rubber Co. of Canada Ltd., G. L. Griffith & Sons Ltd., Holtite Rubber Co. of Canada Ltd., Kaufman Rubber Co. Ltd., Kaufman Rubber (Ont.) Ltd., Miner Rubber Co. Ltd., Northern-Woodstock Rubber Ltd., Panther Rubber Co. Ltd., Seiberling Rubber Co. of Canada Ltd., Viceroy Manufacturing Co. Ltd., and G. B. Smith, and A. U. Oakie, secretary and assistant secretary, respectively, of the Rubber Association of Canada.

According to trade sources, expansion of Canada's synthetic rubber industry in 1951 will result in a 20 to 25% increase in synthetic rubber capacity and give assurance that supplies of rubber will be at hand if natural rubber sources are cut off by troubles in the Far East. A $6,600,000 expansion of facilities at the Polymer Corp. plant in Sarnia, Ont., will supply this additional rubber. Indications are that a 25% increase in productive capacity at the Sarnia plant will be achieved by autumn of this year.

Currently operating at the rate of 130,000,000 pounds of rubber a year, the plant's expansion has been undertaken on the premise that natural rubber prices will remain high for some time and that military needs will have to be met. The expansion will enable the production of Butyl and Polysar S type rubber.

The Dunlop Tire & Rubber Goods Co., Ltd., in its financial report for the year ended December 31, 1950, stated that net profit for the year amounted to $304,202 after providing for income taxes, which compares with a loss of $176,000 in the previous year. Sales increased 47% over the previous year and were 25% higher than the record year of 1948. Current assets as of December 31, 1950, were $8,255,263 compared with $4,667,435 at the end of 1949. Current liabilities at the end of 1950 were $5,230,367, against $1,540,053 as of December 31, 1949.

The Bureau of Statistics has reported that both production and consumption of new rubber increased during December from the previous month. Consumption in December rose 2% to 18,049,744 pounds, from the 17,679,731 pounds consumed in November. Production of synthetic rubber increased to 11,744,320 pounds as compared with 11,692,800 pounds produced in the previous month. Production of reclaim, however, fell to 1,005,760 pounds from the 1,114,240 pounds produced in November. At the end of 1950, there were 7,663,000 pounds of natural rubber on hand, 6,753,600 pounds of synthetic and 3,931,200 pounds of reclaim. At the end of November, 1950, there were 7,279,040 pounds of natural, 6,384,000 pounds of synthetic and 3,691,520 pounds of reclaim on hand.

Trade circles advise that because of a synthetic rubber shortage, the Canadian motorist may expect tire prices to remain high unless and until natural rubber prices fall or more synthetic becomes available. Canadian tire manufacturers have been turned down in their request for more synthetic rubber from the Crown-owned Polymer Corp. above and beyond the previously announced 25% expansion program scheduled to go into operation by autumn.

Polymer Corp. is continuing to export substantial quantities of synthetic to the U. S. where the proportion of natural to synthetic in rubber manufacturing is considerably higher than in Canada. Tire manufacturers had been promised substantially increased supplies of synthetic early in 1951 when certain 1950 export contracts could be terminated. So far there is little indication of these increased supplies forthcoming.

On the basis of rubber consumption in tire and tube making in Canada in the first 10 months of 1950, the break-down showed that 60.2% was natural rubber, 27.02% was synthetic, and 12.7 was reclaimed rubber. At the present time, there has been little change in these proportions.

Firestone Sales in 1950

Sales totaling $736,983,289 for the 12 months ended last December 31 have been reported by Firestone Tire & Rubber Co. The company had previously reported sales of $690,571,555 for its fiscal year ended last October 31. The Firestone statement followed the announcement of U. S. Rubber Co. of sales of $695,755,923 in its annual report for its fiscal year ended December 31. Firestone has held second place in sales in the rubber industry since 1942 and thus, on a calendar year basis, still holds that position, it notes. Goodyear Tire & Rubber Co., which has reported sales of $845,138,051 for the year ended December 31, holds first place in sales in the industry. Firestone said it was making the unusual disclosure of its 1950 calendar year sales because of inquiries received by the company. Firestone offered no explanation for its calendar year sales figure being higher than that of the fiscal year. The difference is explained, however, by the higher volume and higher prices for rubber goods, particularly tires, which were prevalent in the last two months of 1950 compared with the same months of 1949.

Japanese Geon Co. Formed

B. F. Goodrich Chemical Co., Cleveland 15, Ohio, and several large Japanese industrial firms have concluded arrangements for forming a new company, Japanese Geon Co., Ltd., for the manufacture of Geon polyvinyl chloride. The new company has been approved by the Japanese Foreign Investment Commission and the Supreme Commander for the Allied Powers. Production of a new plant at Kambara on Suruga Bay, approximately 65 miles from Tokyo, will get underway in the immediate future. When the unit is in operation it will be staffed by Japanese. Goodrich chemical engineers are to leave shortly for Tokyo to direct construction and initial operation of the plant. Principal Japanese stockholders in the new firm include Furukawa Electric Co., Ltd., Nippon Light Metal Co., Ltd., and Yokohama Rubber Co., Ltd., all of Tokyo.

Named Special Representative

A. E. Whitney, Jr., formerly associated with the research and development laboratories of the Goodyear Tire & Rubber Co., Akron, Ohio, has been named special representative of the Chemical Division of the company, with headquarters in New York. Mr. Whitney will offer technical services to customers in the New England and Middle Atlantic states on Goodyear's Pliovic resins. A native of Paterson, N. J., Mr. Whitney is a graduate of the Newark College of Engineering with a degree in chemical engineering. During World War II, he was actively engaged in work on thin films and coated fabrics at Brooklyn Polytechnic Institute.

NEW RUBBER GOODS

Sta-Put Rubber Ladder Shoe

Designed to prevent ladder slips, the new "Sta-Put" Ladder Shoe and Ladder Toe Grip, manufactured by E. C. Forsythe & Co., 2101 S. Salina St., Syracuse 5, N. Y., is said to be slip-proof on almost any flooring material. The "shoes" are strapped to

the legs of the ladder which will rest on the floor. One model incorporates abrasive-coated rubber which is oil and water resistant. This type of material was used on battleship gun mounts during World War II. Another model features a tread of corrugated rubber. This model is specifically designed for offices, stores, etc., where the floors must not be scratched.

Lee Sonic Ear-Valv

Sigma Sales Corp., Hollywood 28, Calif., has introduced the Lee Sonic Ear-Valv, an ear instrument that will stop loud sudden noises from reaching the ear drum yet admit conversational tones. Unlike a hearing aid, the product has no additional or

dependent parts such as wires or batteries. The Lee Ear-Valv is made of non-corrosive metal and soft rubber. This rubber is a special metallurgical compound developed for the purpose by the Pacific Moulded Products Co. of Los Angeles, Calif. The Lee Ear-Valv is suited for use in industry and sports, and has been tested by the Armed Forces for use in training and combat.

Magic Web Rug Underlay

Magic Web, a rubberized mesh non-skid underlay for rugs or any object which slides or skids, is currently being marketed by the Rubber Fabrics Co., 1510 South Park Ave., Buffalo 20, N. Y. Produced in package sizes as well as in rolls in 24-inch and 36-inch widths, the material can easily and quickly be cut to size with ordinary scissors. It keeps rugs off the floor just enough to "breathe" and vacuuming is said

to be easier. Unlike bulky underlays, Magic Web does not interfere with the opening and closing of doors, while rugs are said to stay neater and last longer. If the material should pick up wax from a heavily waxed floor and temporarily lose its effectiveness, it is necessary only to wash it with warm, soapy water and dry with a towel. In addition to its prime purpose as a rug underlay, Magic Web is also reported to make an excellent mat for the drainboard, as well as in the dishpan or sump sink, to stop dishes from rattling and chipping. According to the manufacturers, the material will not mar or discolor the lightest linoleum or most highly polished floor.

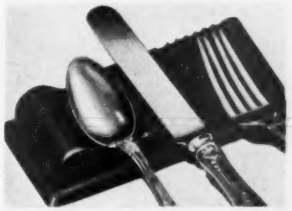
Bassick Hand-L-Hold

Bassick Co., Bridegport 2, Conn., has developed the "Hand-L-Hold," a broom, mop or tool handle-holder which is easily attached to any wall or closet. In opera-

tion, a handle is inserted in a movable, rubber-grooved gripper by an upward swing. It is then held securely by the force of its own weight. To remove it, it is lifted out without any pushing or pulling.

Molded Neoprene Polishing Block

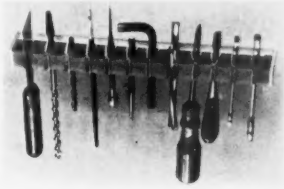
Seager & Seager, Glendale 5, Calif., have introduced the "Polish-Ade," a molded neoprene block designed to make easy the cleaning of silverware and household metal objects. The product is grooved



to fit the tines of a fork, the blade of a knife or the rounded contours of a spoon. In operation, silver polish is applied to the neoprene block. The object to be cleaned is then placed in the appropriate groove and rubbed back and forth. The block itself may be used to clean metal trays, vases, etc.

Self-Adjusting Tool Holder

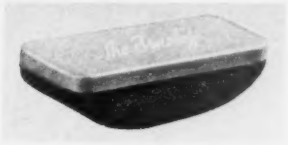
R. K. Products Co., 731 S. W. Front Avenue, Portland 4, Ore., is offering the Graspall Tool Holder, designed for holding a wide variety of objects. The unit features sponge rubber cubes which are



securely boxed in aluminum shoes which run on an aluminum channel base. Wrenches, drills, punches, knives, etc., are inserted between the aluminum boxed sponge rubber cubes where they are held securely at even pressure. Graspall holders are available in 11½-inch lengths with 12 stalls.

Brushoff All-Purpose Brush

"Brushoff", a latex-saturated pure wool all-purpose brush, has been developed by Robert W. Lehrfeld, Inc., 245 West 28th St., New York 1, N. Y. The brush is made of wool fibers which have been



bonded with neoprene latex. The metal back of the brush comes in different colors. The brush may be used to remove dust, lint, etc., from clothes, suede shoes, handbags and upholstery. The regular size model is 5¼ inches long, while the "Pocket 'n Purse" model is 3 inches long.

OBITUARIES

Lewis H. Brown

Lewis H. Brown, chairman of the board and chief executive officer of the Johns-Manville Corp., died unexpectedly of a heart ailment on February 26 at Delray Beach, Fla. He was 57 years old. Born in Creston, Iowa, Mr. Brown worked his way through the University of Iowa and was graduated in 1915. During World War I, he served in France as a captain of infantry. On his return he was engaged by Montgomery Ward & Co., and within eight years was assistant general operating manager of all plants. When the president of Montgomery Ward became president of Johns-Manville in 1927, he took Mr. Brown with him as assistant. Mr. Brown became president of the company in 1929 upon his predecessor's death. Mr. Brown was extremely active in public affairs and in 1947 made a survey of Western Germany's capacities as a functioning European power for the United States Military Government. He was elected chairman of the board of Johns-Manville in 1946. Funeral services were held on March 1 at Christ Protestant Episcopal Church in Greenwich, Conn., with interment in Putnam Cemetery in that city. His wife and three daughters survive.

Frank A. Jepson

Frank A. Jepson, purchasing agent of the Acushnet Process Co., New Bedford, Mass., died on February 3 at St. Luke's Hospital in New Bedford. He was 53 years old. A native of Danbury, Conn., Mr. Jepson came to New Bedford at an early age and was graduated from New Bedford High School. Before joining Acushnet, Mr. Jepson worked for the Manufacturers Supply Co. in New Bedford as a salesman. In his earlier years at Acushnet, he held joint positions of personnel manager and purchasing agent. For the greater part of his time, however, he held the single post of purchasing agent. Last year, Mr. Jepson had been elected a vice-president of the Purchasing Agents Association. He was a member of the Star of the East Lodge of Masons of New Bedford. His wife and two sons survive.

Robert B. Williams

Robert B. Williams, plant superintendent of the Pennsylvania Rubber Co. in Jeannette, Penna., succumbed to a cerebral hemorrhage on January 28, after being stricken at his home the previous day. He was 44 years old. Mr. Williams joined Pennsylvania Rubber in 1922, and for the past two years had been acting in the capacity of plant superintendent. He is survived by his wife, a son and a daughter.

F. Jasper Blake

F. Jasper Blake, oldest-in-point-of-service domestic sales representative of the Goodyear Tire & Rubber Co., died on January 28 in a hospital in Phoenix, Ariz. He would have been 79 years old on his next birthday, March 24. Continuously associated with shoe products sales since he joined the company in 1906, Mr. Blake started that department and flooring sales. He was the first representative of both divisions for Goodyear. In 1917, he was placed in charge of sales to shoe factories. In 1920, Mr. Blake was assigned to direct the company's shoe products sales in Boston, Mass., where he served as manufacturer's representative until the time of his death. A graduate of Phillips-Exeter Academy, Mr. Blake was awarded the Litchfield Medal in 1939 as the company's best salesman in the United States. In 1946, during a visit to Akron, Mr. Blake was presented with a 40-year service pin. His body was returned to Boston from Phoenix where the funeral was held on February 1. He leaves his wife and two sons.

Henry B. Morse

Henry Bowditch Morse, chief chemist of the Rubber Footwear Division of the Endicott Johnson Corp., Johnson City, N. Y., died on January 26 at Rock Island, Ill. He was 60 years old. A native of Salem, Mass., Mr. Morse was graduated from Salem High School in 1907, and the University of Massachusetts. Mr. Morse was recognized as one of the nation's outstanding chemists engaged in the production of rubber footwear. During World War II, he was one of the five members on the Rubber Control Board of the War Production Board. He was a member of the American Chemical Society, the Mosaic Lodge of A. F. & A. M., and the Salem Marine Society. Final resting place was at Walnut Grove Cemetery in Danvers, Mass. His wife survives.

Paul H. Carlson

Paul Howard Carlson, formerly sales manager of the American Instrument Co. in Silver Springs, Md., died on March 4 in Mt. Alto Veterans Hospital after a long illness. He was 48 years old. Mr. Carlson moved to Silver Springs after serving with the Philadelphia Ordnance Depot during World War II. At Philadelphia, he was executive assistant of the Industrial Division and later was in charge of the Baltimore, Md., branch of the office. Before entering the Army, Mr. Carlson was with the York Ice Corp. from 1924 to 1942 and became assistant national supervisor of the Sales Department. He was graduated from the University of Colorado in 1922 as a chemical engineer. He leaves his wife and a son.

Andre H. Andreoli

Andre H. Andreoli, associated with the rubber industry for many years both in the United States and abroad, died on February 20 in Amsterdam, The Netherlands. He was 50 years old. A native of Amsterdam, Mr. Andreoli came to the United States in 1911. He attended old Buchtel College, now Akron University. During 1919 and 1920 he was employed by Whitman, Barnes & Co., and during 1921 and 1922 worked for the International Harvester Co. He went with the Goodyear Tire & Rubber Co. in 1922, first in its Aeronautical Division and finally with its Export Division. During that time he was a field sales representative in both the Netherlands and the Netherlands East Indies. In 1931 he joined the General Tire & Rubber Export Co. as manager of its Netherlands branch, and continued in that capacity until the outbreak of World War II. At the end of the war he established his own business, General Import Nederland. This company represented General Tire exclusively throughout the Netherlands. He leaves his wife, his brother, Joseph Andreoli, executive vice-president of the General Tire & Rubber Export Co., and six children.

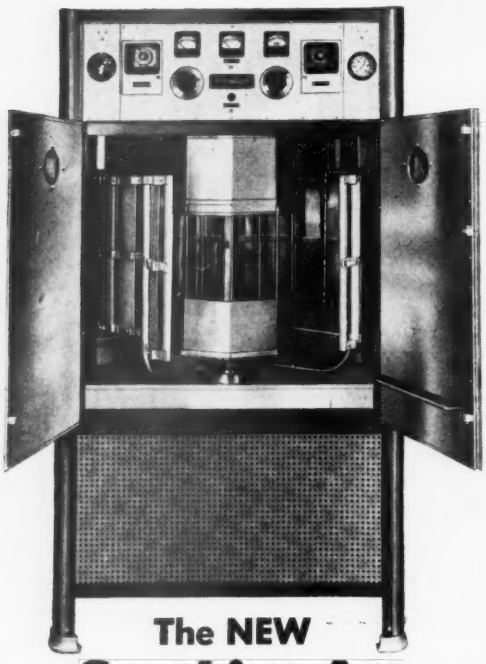
J. Newton Smith

J. Newton Smith, president of the Boston Woven Hose & Rubber Co., Boston, Mass., died at his home in Salem, Mass., on February 5, after an illness of almost three months. Born in Lynn, Mass., Mr. Smith was graduated from Yale University. He had been associated with Boston Woven Hose since 1912, serving successively as its vice-president, treasurer and president. Mr. Smith took an active part in the development of the rubber industry and served for many years as a director of the Rubber Manufacturers Association. He was also a director of several corporations, including the National Shawmut Bank of Boston and the Liberty Mutual Insurance Co. Mr. Smith was also active in civic affairs and was a life trustee of Salem Hospital. He was a member of the Union Club of Boston, the Yale Club of New York, the Eastern Yacht Club of Marblehead, Mass., and the Salem Country Club. He is survived by his wife and two daughters.

Reclaimers Rejecting Some Tires

According to Henry M. Rose, president of the Scrap Rubber Institute of the National Association of Waste Material Dealers, Inc., four types of tires are being rejected by the majority of reclaimers. Mr. Rose said that these types are: (1) Tires with wire cord instead of fabric cord. Such tires are not acceptable, as well as any others that may contain iron lugs, iron studs, or any sort of iron in any way, shape, form or manner; (2) Single tube tires that contain gummy centers; (3) Farm implement tires. These are not generally accepted and are not considered as good delivery; (4) Tires damaged by fire or heat.

MUEHLSTEIN • FIRST IN SCRAP RUBBER AND SCRAP PLASTICS •



The NEW

Sunshine Arc Weather-Ometer

Type XW

A modernized and redesigned version of the open flame X-1 and X-1-A Weathering Units

Many of the control features that have proven their dependability in the Atlas Twin Arc Weather-Ometer have been combined with some features of the original X-1-A weathering unit to make a new Weather-Ometer of advanced design.

In the Type XW a new means of maintaining constant temperature is provided. Far more accurate temperature control is now available.

Radiation is from a Sunshine Carbon Arc which is of the motor-driven, open-flame type. Natural sunlight or intensified ultra-violet radiation is available depending upon the type of carbons and filters used. The light source has been improved to provide 16 hours of continuous operation as well as a number of other added conveniences.

All instruments are located on a convenient control panel, including an arc voltage setting switch and meter, cycle control of light and water spray, 1 to 24 hour shut-down time switch, thermo-regulator and running time meter.

Type XW is fully automatic and may safely be left in unattended operation overnight. If deionized water is to be used, aluminum spray piping can be furnished. The capacity of the stainless steel lined testing chamber is 54 panels. The machine is sturdily constructed and is shipped assembled, ready for connection.

ATLAS ELECTRIC DEVICES COMPANY

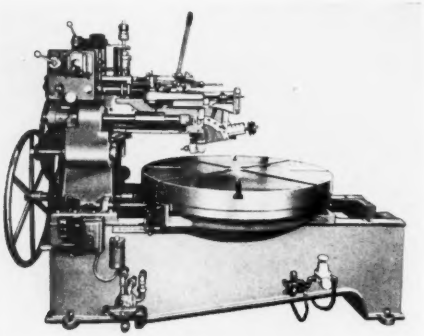
361 West Superior St., Chicago 10, Ill.

FADE-OMETERS • LAUNDER-OMETERS • WEATHER-OMETERS

NEW EQUIPMENT

Bridgwater Tire Mold Engraver

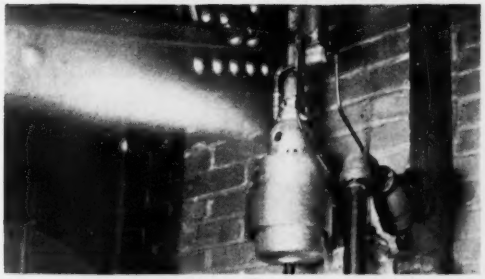
The use of a master pattern or template in the Tire Mold Engraving Machine developed by the Bridgwater Machine Co., 63 Cherry St., Akron, Ohio, enables a stylus or follower to guide the cutting tool to duplicate faithfully the master pattern in the mold. The machine is made in three sizes. Model No. 0 has a cutting radius of 1 to 6 inches. It is designed for engraving bicycle, motorcycle or small industrial tire molds. Model No.



1 has a cutting radius from 2 to 10 inches, a range sufficiently great to handle 80 to 85% of tire mold requirements. In general, Model No. 1 will engrave top or side cuts up to an 8.25-inch tire size. Model No. 3 has a cutting radius from 3 to 16 inches. With this unit molds can be engraved with cross-sectional widths up to 27 inches, with outside diameters over 100 inches, and with an outside tread radius up to 50 inches. All models may be equipped with either a radial cut head for radial engraving of top or sidewall designs, or a bevel cut head for straight line engraving of sidewalls.

All three size machines are equipped with hydraulically powered table travel (in and out) and hydraulically powered head lift. Proper feeding of the mold to the cutter is simplified by easily adjustable controls for slow or rapid traverse of the table. The movable range of the carriage is adjustable to any desired position over the full length of the bed. A convenient scale indicator on the side of the bed and quick-release, positive locking stops facilitate setting and maintaining the correct cutting radius. The operator may traverse the carriage the full length of the bed for convenient crane handling of the tire mold and return the carriage to its exact original setting for the cutting operation. Both manually and hydraulically powered slides are equipped with quick-release, positive locking slide stops to facilitate accurate control over the angular range of the spindle travel. A complete line of optional accessories is offered for use with the engraving machines.

an easy way to PREVENT EXPLOSIONS



Armstrong Controlled *Steam* Humidification

ARMSTRONG air-controlled Steam Humidifiers are worth their weight in gold wherever explosive vapors are present. By adding steam directly to the air, these units automatically maintain the relative humidity necessary to dispel any chance of a static electricity spark.

Simple, wholly dependable and economical, Armstrong Steam Humidifiers have been thoroughly tested and proven in rubber cement house applications. Humidifiers can be shipped from stock, ready for easy installation. GUARANTEED TO SATISFY or your money back.

for full details on

Positive Protection Against Static Explosion Hazard

Send for this bulletin—12-page bulletin 1772 gives complete information and prices.

ARMSTRONG MACHINE WORKS
822 Maple Street • Three Rivers, Mich.

Check the AR rating of *Your Product* with the

Taber ABRASER MODEL 140

NEW DUAL WHEEL ABRASION TESTER

• Accurately measures wear due to rubbing abrasion. Used internationally for testing textiles, rubber, organic coatings and other flat materials under dry or wet conditions.

Write for new literature

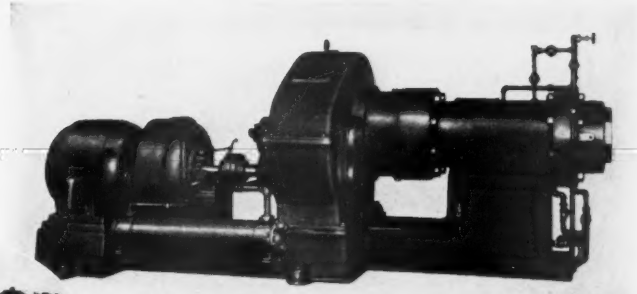
TABER INSTRUMENT CORP.
138 GOUNDRY STREET
NORTH TONAWANDA, N. Y.

***Abrasion Resistance**

TWO MODELS

LARGE *Extruders . . .*

. . . The complete facilities of National-Erie engineering, metallurgical control, foundries and machine shops enable us to meet your largest extruder specifications . . . to assume full responsibility for your extruder requirements. At the right is a National-Erie 8" standard tubing machine . . . From blue print to finished machine ready to operate you can depend upon us.



. . . *to* LAB EXTRUDERS

At the left is shown one of our 1 1/2" small production experimental extruders for rubber or plastics. Submit your rubber or plastics machine requirements to us—we shall cooperate fully and promptly.

Complete Rubber and Plastics Working Machinery

NATIONAL ERIE CORPORATION

ERIE, PENNSYLVANIA • U. S. A.

everybody talks
QUALITY

R-1599 R-2199 R-2899

...these Pure Light Red Iron Oxides by Williams assure it!

They represent the ultimate in red iron oxide colors for the rubber industry.

Williams iron oxides come to you with all the benefits of our 72 years in the pigment business . . . and as a result of our experience in producing pure red iron oxides to specifications of the leading rubber companies.

Each is manufactured to rigid specifications for copper and manganese content, pH value, soluble salts, fineness, color, tint and strength by controlled processes and with special equipment. *The result is absolute uniformity of product.*

If you haven't already done so, try these finest of all iron oxide colors. Your own tests will show there is no equal for Williams experience.

LET WILLIAMS PUT THE MICROSCOPE ON *Your* COLOR PROBLEM

Whatever your color problem, bring it to Williams. Our 72-year experience can often save you time, money, and headaches in proper color formulation.

Address Dept. 8, C. K. Williams & Co., Easton, Pa.

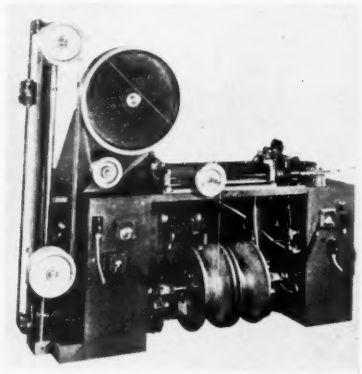
IRON OXIDES • CHROMIUM OXIDES
EXTENDER PIGMENTS

WILLIAMS
COLORS & PIGMENTS

C. K. WILLIAMS & CO.
EASTON, PA. • EAST ST. LOUIS, ILL. • EMERYVILLE, CALIF.

Continuous Extrusion Take-Up Unit

A new high-speed constant-tension, dual-reel continuous extrusion take-up unit with integral capstan and tension stand, for rubber or plastic coated wire, cord or cable has been developed by Industrial Ovens, Inc., 13825 Triskett Road, Cleveland 11, Ohio. Speed range of this new take-up is from standstill to more than 2,600



feet per minute, with instantaneous acceleration of the empty reel to synchronous wire speed as soon as cross-over is made. No interruption or slow down in the winding process is necessary to shift from full to empty reel. All drives—for reels, capstan and traverse—are hydraulic and are completely self-contained with fully-enclosed, oil-immersed gears. There are no chains or open gears in the unit. The hydraulically driven traverse provides a 25 to 1 lay range.

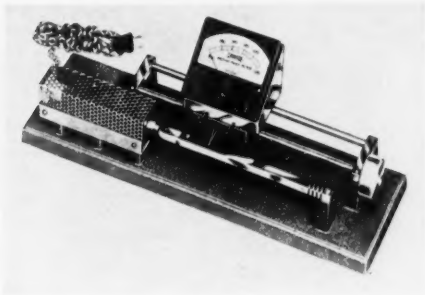
A unique reel mounting, featuring a demountable shaft and bearing housing assembly carried by a heavy bearing mounting on a lever-operated, tilting base, permits loaded reels to be deposited gently on the floor upon the reel flanges so that reel damage and distortion are minimized. Provision has been made for "ends out" winding. The entire unit is a complete, compact, fully-integrated "package" ready for connection to power line. It is also available without the capstan or with separate, floor mounted capstan and tension stand.

Self-Loading Pick-Up Unit

Designed to eliminate manual lifting of 200-pound bars of metal, a new, self-loading pick-up element produced by the Riverside Metal Co., Riverside, N. J., also finds applicability in the handling of rubber, plastics and other goods. The lifting element resembles two giant "C" clamps, welded in parallel. The device is constructed by bending two flats into "C" shapes, reinforcing with additional flats welded perpendicular to the outer side of the "C" flats, and joining the two by welding connecting members. In operation, items are stacked on pallet blocks and when a load is to be moved, the pick-up device slips under the load, much as a fork truck would, and an electric hoist or crane picks up and transports the loaded element. The eye which engages the hoist hook is mounted toward the open end of the device so the center of gravity tilts the load back and "cradles" it, thus preventing it from spilling.

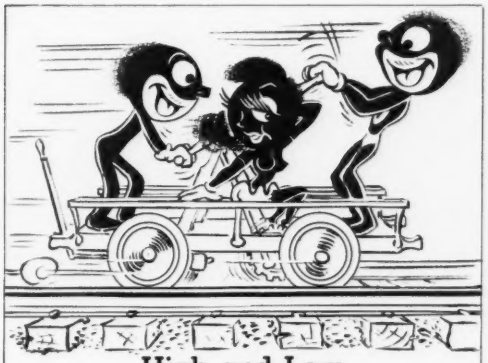
Clarkstan Melting Point Meter

A new melting point meter for the fast and accurate determination of melting points between 20° and 500° F. of waxes, gums, fats, tars, plastics, low melting alloys, and organic and inorganic compounds, has been developed by the Clarkstan Corp., 11921 West Pico Blvd., Los Angeles 64, Calif. An accurate determination



of melting point may be made with a quantity of but a few milligrams of substances. With reasonable precaution, samples may be recovered uncontaminated.

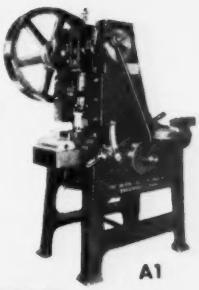
The meter operates by placing a small quantity of the substance on a chromium-plated platen or bar, which is electrically heated so that a temperature gradient obtains along its length. By observation, the demarcation between the molten and solid particles is determined. At this point, the small thermocouple junction is placed. Within a few seconds, the meter indicates the temperature of the point chosen. A screw feed allows the operator to follow the melting point as the bar temperature changes. Both platen and thermocouple are easily removed for cleaning and for change in case of damage or contamination. Any one of the four sides of the platen may be used. The instrument operates on 100 volts, AC or DC.



High and Low

SEE PAGE 638

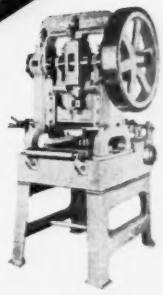
For MORE than Half a Century the name COULTER has meant MORE in higher quality cuttings . . . MORE IN GREATER PRODUCTION. So much MORE that . . .



A1

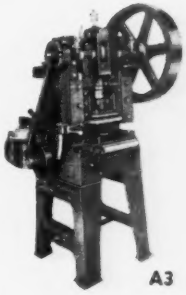
Men who Know PRODUCTION MACHINES Choose

the James COULTER Machine Co. BRIDGEPORT, CONN.



MODEL A-1
Cutting Heels at high speed production or short runs.

MODEL A-2
Cutting Multiple Heels, Half and Full Soles with stock grain.



A3

MODEL A-3
Cutting Multiple Heels and Taps with or across stock grain.

MODEL A-2s
(Not illustrated)
Cutting across grain of stock.

COULTER PRODUCTION MACHINES SINCE 1896

TESTED IS TRUSTED

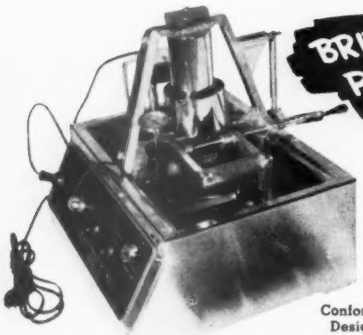
In switching from natural to synthetics

let these two testers guard you against costly errors, and guide you to quick arrival at the necessary changes in compounding.

REBOUND TESTER

GOODYEAR-HEALEY REBOUND TESTER
FOR A.S.T.M. TEST 1054-49T

Liveliness is a factor that has to be watched and strengthened as you use more synthetic. This Scott Tester* evaluates the liveliness of elastomers, as well as the depth of impact required to produce it.



Conforms to A.S.T.M.
Designation D746
D11 FOR RUBBER
D20 FOR PLASTICS

With a range of + 50 to − 80°C, this tester—which is self-contained and readily portable—can reproduce extremes of temperature under which rubber and plastics shatter like glass. A typical current use is in testing synthetic tubes of airplane tires for Arctic use.

REQUEST CATALOG 50

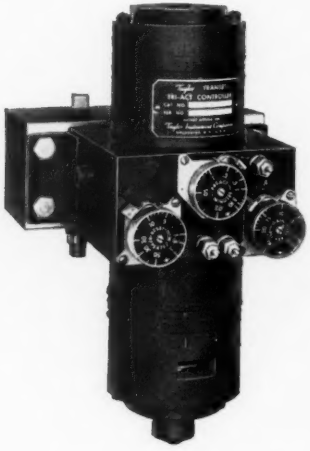
SCOTT TESTERS, INC. 85 Blackstone St.
Providence, R. I.

*Registered Trademark

Standard of the World

Transet Tri-Act Controller

Incorporating all the basic process control responses of conventional controllers, the Transet Tri-Act Controller developed by Taylor Instrument Companies, Rochester 1, N. Y., utilizes them in a different manner to give improved performance. The 4⅜ by 5-inch miniature pneumatic receiver has a circuit which contains two closed loops in series. The first of these contains fixed proportional response and adjustable rate action; the second, adjustable proportional response and adjustable automatic reset. The new circuit in the unit permits four times faster reset rate action than conventional instruments. The composite effect of the three responses allows start-up and pneumatic setting with no overpeaking.



Other features incorporated into this new controller include a high capacity relay air valve which permits faster output action in response to process changes; a self-sealing manifold to make piping and maintenance simple; a new, non-rotating type needle valve used on the adjustment dials assures duplication of response settings with a high order of accuracy; and built-in orifice cleaners and air strainers which permit on-the-job servicing.

Worthington Pump and Machinery Corp., Harrison, N. J., has introduced a new **variable speed transmission series.** The new drives incorporate the Worthington tandem belt design, include six models, and offer variations from 16 to 1 to 6 to 1. They are particularly suited to applications where space limitations require extreme compactness.

EQUIPMENT WANTED—USED

Latex Dipper—3 stage, hydraulic or electronic drive, complete with circulating tanks. 38" or 42" strap size, 2 leach tanks approx. size 36" width x 20'; 1 exhaust fan with motor—36" size fan; Industrial oven, approx. 6' x 30' steam heated with complete controls, temp. range, 160°-240°; Mixing Mill, 84", with motor; Bale cutter. Contact: Manufacturer. Address Box 942-E, RUBBER AGE.

THE SMACO GASKET SPLICER

SPLICER
VULCANIZER
EMBOSSER
MOLDER

Features

- SPEED
- NO BREAKDOWNS
- HEAT CONTROLS IN BOTH BRONZE PLATENS
- ONE OPERATOR — FROM 1 TO 8 UNITS
- LONG LIFE HEATERS AND THERMOSTATS

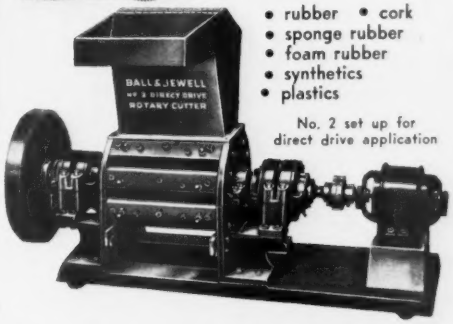
Ask ABOUT OUR **HAND RUBBER CUTTER**

For Further Information . . . . Write to
SIVON MACHINE & MFG. CO.
PAINESVILLE, OHIO

B&J

No. 2 HIGH CAPACITY GRINDER FOR WASTE MATERIAL

- rubber • cork
- sponge rubber
- foam rubber
- synthetics
- plastics



No. 2 set up for direct drive application

You can cut practically any size or weight piece that can be fed into 8" x 28" throat opening. High production capacity, up to 2,000 lbs. per hr. Write for complete data.

B & J builds the answer to any grinding problem!

For grinders with capacity of 50 to 3,000 lbs. per hr. contact:

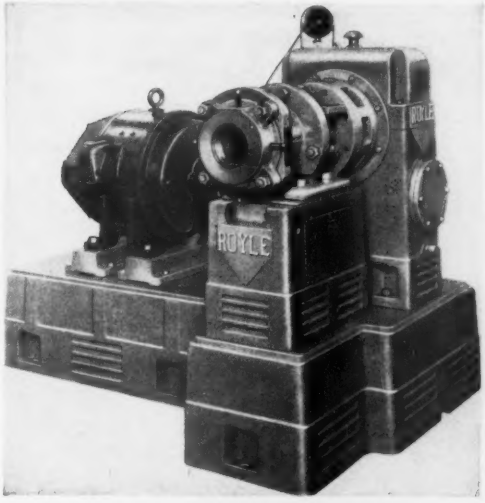
BALL & JEWELL, INC.
28 Franklin St., Brooklyn 22, N. Y.

1865-1951

Designed To Extrude RUBBER or PLASTICS

IN these days of rapidly changing developments owners of Royle extruding machines are in the advantageous position of being able to adapt their extruders to either rubber or plastics production. If you are faced with the problem of extruding rubber and plastics the versatility of ROYLE extruders is of paramount importance to you. Whether you require a light or heavy production extruder features have been incorporated to assure maximum results. The change-over is quickly and simply accomplished.

Send for your copy of Bulletin No. 448. It describes these features and how they may be applied to older type extruders.



ROYLE # 2 Extruding Machine. Non-extended cylinder, plain tubing head.

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

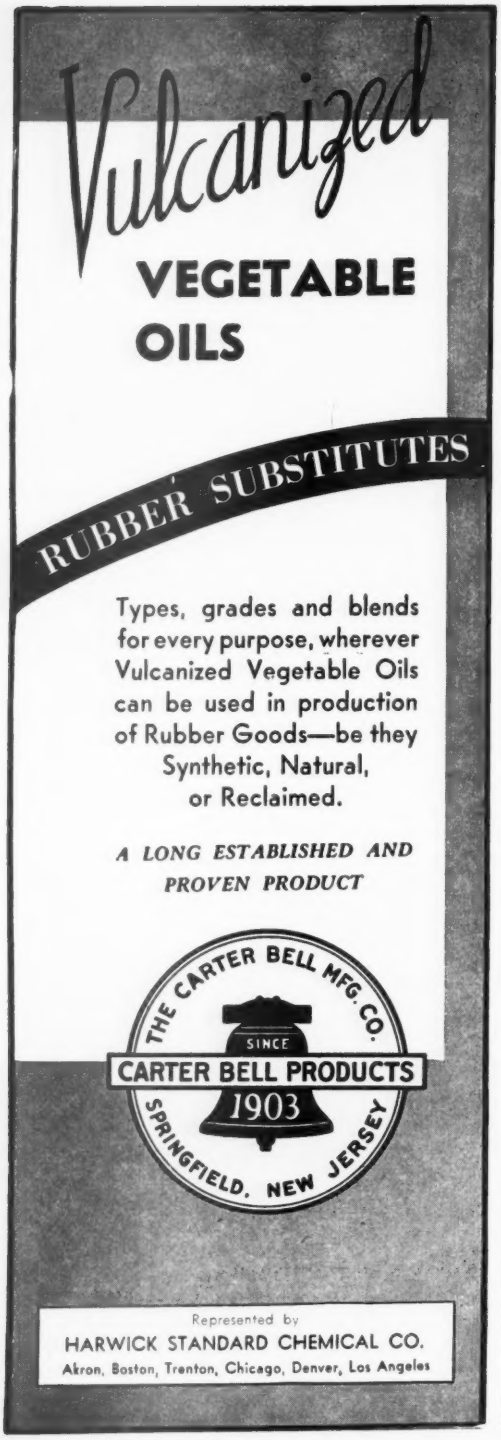
London, England
James Day (Machinery) Ltd.
REgent 2430

Home Office
J. W. VanRiper
SHerwood 2-8262

Akron, Ohio
J. C. Clinefelter
JEfferson 3264

Los Angeles, Cal.
H. M. Royal, Inc.
LOgan 3261

PATERSON 3, NEW JERSEY


Vulcanized
VEGETABLE
OILS
RUBBER SUBSTITUTES
Types, grades and blends for every purpose, wherever Vulcanized Vegetable Oils can be used in production of Rubber Goods—be they Synthetic, Natural, or Reclaimed.
A LONG ESTABLISHED AND PROVEN PRODUCT
THE CARTER BELL MFG. CO.
SINCE
CARTER BELL PRODUCTS
1903
SPRINGFIELD, NEW JERSEY
Represented by
HARWICK STANDARD CHEMICAL CO.
Akron, Boston, Trenton, Chicago, Denver, Los Angeles

REVIEWS

BOOKS

Rubber Formulary: 1949. Edited by Kathleen S. Rostler. Published by The Rubber Formulary, 1612 19th St., Bakersfield, Calif. Available on Subscription Basis: $85.00 per year.

When the Rubber Formulary was first organized, its cataloging and indexing efforts were confined to published literature only, that is, data appearing in rubber and allied journals published in various parts of the world. In an effort to provide subscribers with the most complete and diversified compendium of formulations available, the publishers extended their efforts to include compounds appearing in the multifarious technical literature issued by the suppliers of rubber chemicals and compounding ingredients. Compounds selected from technical bulletins of the previous year are included in the Formulary for 1949, making that edition, as well as subsequent editions, of even greater value to compounders than heretofore.

In brief, the Rubber Formulary is a monthly cataloging service for all rubber and vinyl compounds appearing in the technical literature. These compounds are abstracted and recorded on specially designed punch cards in such a manner that the user can quickly locate any compound on the basis of its properties. Cards are sent to subscribers monthly and no special equipment of any kind is required in utilizing the cards. The Formulary is a valuable, inexpensive tool for every rubber technologist and merits a place in every rubber library.

•

Chemical Facts and Figures. (Third Edition, 1950.) Published by the Manufacturing Chemists' Association, Inc., 246 Woodward Bldg., Washington 5, D. C. 8 x 10½ in. 419 pp. $3.00.

Statistics on United States production, sales, imports, exports, and prices of chemicals, chemical products, and chemical raw materials for the period 1946 through 1949 are contained in this new third edition of the Manufacturing Chemists' Association's well-known chemical fact book. The volume also contains partial data on the first six months of 1950. Like its predecessors, this edition is a part of the Association's plan to publish a continuing record of chemical industry statistics. Previous editions covered the periods 1929-1939 and 1940-1945. In addition to U. S. data, the book contains available Canadian statistics, including a newly-added section on minerals.

Financial records are included for 100 leading chemical process companies on an annual basis for the ten years 1939-49. A special section on employment and wages includes data on average earnings, length of work week, number of wage earners, labor turnover, and work stoppages. The present volume includes about 500 new chemicals on which statistical data have become available since the last edition.

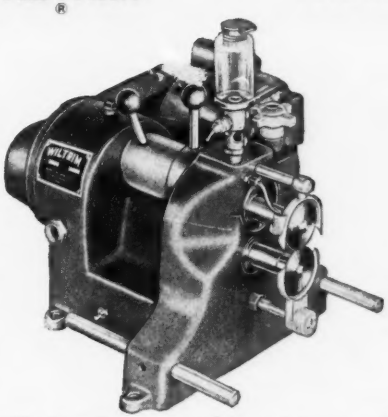
•

Sources of Economic Information for Collective Bargaining. (Research Report Number 17.) By Ernest Dale. Published by the American Management Association, 330 West 42nd St., New York 18, N. Y. 6 x 9 in. 170 pp. $3.75.

This report examines the data now available to negotiators and arbitrators who are seeking a more factual approach to wage setting. It discusses in detail the sources of figures and the nature of the arguments cited by both management and unions in connection with the four criteria most commonly used in the determination of wage rates: (1) cost of living; (2) productivity; (3) "going" wage rates; (4) ability to pay. It also discusses many of the problems which will undoubtedly arise as government, management, and labor attempt to arrive at an equitable system of wage stabilization.

WILTRIM®

Model DF
TRIMMER



Wills thirty-five years experience brings you this outstanding successor to the famous earlier Models D, DE, and DM trimmers.

MACHINES ARE AVAILABLE FOR FREE TRIAL

FERRY MACHINE COMPANY
WILLS RUBBER TRIMMING DIVISION
KENT, OHIO, U.S.A.
(Export Sales Through Binney & Smith, International)

IN YOUR RUBBER FACTORY

1. Do you have high pressure reducing valve problems?
2. Do you have pressures as high as 6,000 lb. per sq. in.?
3. Are you having trouble with the valves you are using now?
4. Have you ever tried the

ATLAS Type "E"

High Pressure Reducing Valve

shown at the right? This remarkable valve reduces the highest pressures *without shock*—pressures as high as 6,000 lb. per sq. in.—water, air, or oil. That's why it is now being used in the leading rubber factories of the world.

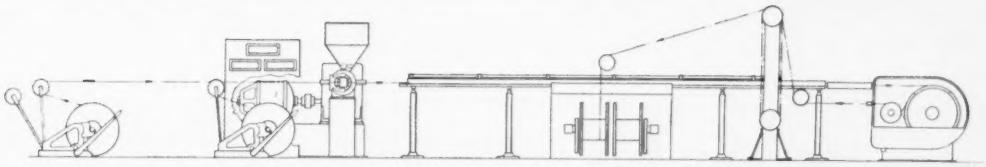
Who's Behind It?

The Atlas Valve Co. is behind it—a company that has been making regulating valves *exclusively* for more than a half century. That's why every detail in Type "E" is RIGHT. Strongest forged steel body. Internal metal parts are specially protected. A formed packing of special material superior to leather is used which is immune to all fluids commonly used in hydraulic machinery. The pressure on the seat is balanced by a piston with the result that variations in high initial pressure have little effect on the reduced pressure.

Want complete data on Type "E"? We will be glad to send it by return mail.

For other ATLAS rubber factory products see the partial list in our ad in the January 1951 issue of RUBBER AGE

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
251 South Street, Newark 5, N. J.
Represented in Principal Cities



DAVIS-STANDARD THERMO-PLASTIC WIRE INSULATING EQUIPMENT

COMPLETE EQUIPMENT FOR PLASTIC WIRE INSULATING

A complete line of rubber and plastics extruders

THE STANDARD MACHINERY COMPANY, MYSTIC, CONN., U. S. A.

Established in 1848 — *Incorporated in 1875*

Export Office:	Canada:	Chicago:	Pacific Coast:
Drexel Bldg. Philadelphia 6.	Williams & Wilson, Ltd. Montreal, Toronto	Grant Engineering Co.	W. H. Del Mar Co. 5140 Crenshaw Blvd. Los Angeles

The Institution of the Rubber Industry

LONDON

"THE TRANSACTIONS I.R.I."

The following papers have been published in Vol. 26 Nos. 1-4 of the "Transactions I.R.I."

"Rubber as an Engineering Material." Symposium papers and discussions.
"Natural Rubber: Its Properties as a Raw Material for the Manufacturing Industry." A. van Rossem.
"The Weber Test for Natural Rubber." H. J. Stern.
"Continuous Vulcanisation Processes." W. H. Reece.
"Neoprene Compounding." H. J. Lanning.
"Carbon Black Manufacture in Great Britain." Fred H. Amon.
"Abrasion Resistance and its Measurement." J. M. Buist.
"Stability of Compounded Latex." K. W, Hayes.
"Determination of Copper in Rubber Latex." F. C. J. Poulton and M. E. Tunnicliffe.
"Oxidation of Natural Rubber Hydrocarbon." L. Bateman.
"Continuous Vulcanisation with reference to Flooring, Belting, etc." J. M. Bierer.
"Determining the Dynamic Coefficient of Friction of Vulcanised Rubber." A. Boonstra.
"Treatment of Abnormal Clonal Latices." E. W. Madge.
"Use of Statistical Methods in the Planning of Road Wear Tests." J. M. Buist, R. G. Newton and E. R. Thornley.

SUBSCRIPTION $10.00 PER ANNUM FOR SIX ISSUES. POST FREE. PUBLISHED BI-MONTHLY.

"ANNUAL REPORT ON THE PROGRESS OF RUBBER TECHNOLOGY 1949"

A readable and informative record of the outstanding developments in rubber technology made in the year.

PUBLISHED DECEMBER 1950.
AVAILABLE AT $3.00.

"PROCEEDINGS OF THE RUBBER TECHNOLOGY CONFERENCE, LONDON 1948"

Containing the 43 papers read at the Conference, together with resultant discussions, covering every recent development in the chemistry and physics of natural and synthetic rubbers.

COPIES AVAILABLE AT $10.00

Enquiries for literature and details of membership to:—

THE REGISTRAR
INSTITUTION OF THE RUBBER INDUSTRY
12, WHITEHALL
LONDON, S.W. 1, ENGLAND

BOOKLETS, CATALOGS, etc.

Evaluation of Inert Fillers in Vinyl Plastics. (Bulletin No. 4.) Diamond Alkali Co., 300 Union Commerce Building, Cleveland 14, Ohio. 8½ x 11 in. 10 pp.

This bulletin shows how Diamond-formulated precipitated calcium carbonates, made in eight different grades, meet the vinyl plastic compounder's basic requirements of cost, purity, color, processability, light stability, plasticizer absorption, uniformity and physical structure. Fully explained are the basis used for the evaluation study encompassing nine fillers discussed, the recipe employed, and the method followed to determine filler concentration. Effects of loading vinyl plastics with each type inert filler on cost, stress-strain and crescent tear are tabulated. Also included are listings of the parts of each filler required to give the pound volume cost, and two charts graphically depicting tensile strength and crescent tear results.

•

Industrial Dust Control Through Exhaust Systems. By W. O. Vedder. Pangborn Corp., Hagerstown, Md. 5 x 7¼ in. 50 pp.

Liberally illustrated with photographs and drawings, this book treats, in three major sections: (1) exhaust hoods and piping systems; (2) dust collecting equipment; (3) exhausters and drives. Introductory chapters list six basic methods of accomplishing dust control, and give reasons why improperly planned dust collection installations do not fully perform their function. The book also analyzes with text and line drawings the three basic elements of dust control exhaust systems. To make the book especially helpful to the individual reader, a detached problem sheet is included on which the reader can enter data particular to his case.

•

Banbury Mixers. (Bulletin No. 189.) Farrel-Birmingham Co., Inc., Ansonia, Conn. 8½ x 11 in. 32 pp.

Up-to-date information about recent improvements in Banbury Mixer design and construction, new applications and new installation layouts is contained in this booklet. General descriptive matter and illustrations of all sizes of Banbury Mixers, including a table of sizes and capacities, cross-section and cutaway views showing details of construction, and layout drawings showing various methods of installation in combination with other machines are provided. Also described and illustrated are the new Uni-Drive Banbury Mixers, which have been especially developed to take the heavier loads resulting from mixing tougher stocks at higher speeds.

•

What It Takes To Make Your Car. Automobile Manufacturers Association, 320 New Center Building, Detroit 2, Mich. 8½ x 11 in. 48 pp.

This handsome booklet describes and illustrates the various steps in the production of an automobile. From the earliest planning stages, the gathering of raw materials and the consideration of potential markets, the booklet follows through on the fabrication of the different parts of the automobile to final assembly. The machines which are used to create the finished vehicle are described while such subjects as methods of storage, production techniques and costs are also discussed.

RUBBER CHEMISTS

Plant making diversified lines of hose, mechanicals, calendered and coated products requires chemists experienced in these lines. Apply in writing only with details of background and experience.

ATLANTIC TUBING & RUBBER CO.
Mill Street, Cranston 5, R. I.

The Story of Surface Coatings Based on Vinylite Resins. Bakelite Division, Union Carbide and Carbon Corp., 30 East 42nd St., New York 17, N. Y. 8½ x 11 in. 28 pp.

Protective and decorative Vinylite coatings for all types of surfaces are described in this booklet. The booklet shows actual cases of savings made possible through the use of these coatings where destructive forces such as weather, abrasion, moisture, chemical attack, and rust are at work. The booklet also describes the variety of surfaces which can be coated, including metal, paper, cloth, masonry, brick, concrete and wood, and discusses the various techniques of application such as spraying, brushing, roller and knife coating, and dip coatings to which surface coatings based on these resins are suitable.

•

Corson-Cerveny Micro-Bellows Pump. Research Appliance Co., Box 413, West View Road, Pittsburgh 9, Penna. 5½ x 8½ in. 12 pp.

A complete description of the Corson-Cerveny Micro-Bellows Pump is offered in this bulletin. Among the factors considered are construction; operation, capacities, electrical requirements, corrosion resistance, maintenance and repair, applications and parts. Cutaway drawings reveal the inner construction of the pump while other drawings illustrate the various component parts of the unit. Also illustrated and described are the various types of bellows which may be fitted to the pump.

•

Rubber in America Before 1492. By J. Eric S. Thompson. Published by Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass. 6 x 9 in. 10 pp.

This charmingly illustrated booklet presents an informal account of ancient American rubber uses and applications. The author relates some interesting data on the uses to which the peoples of Mexico and Central America put rubber in the years long before Columbus reached the new world. Early Mayan and Aztec drawings depicting the use of rubber in games, as a medicine and in religious ceremonies, are reproduced.

•

Colloidal Graphite as a Parting Compound. (Bulletin No. 427.) Acheson Colloids Corp., Port Huron, Mich. 8½ x 11 in. 6 pp.

This publication describes how colloidal graphite dispersions are used profitably in the rubber, glass, metal working, and corrugated box-board industries. Given are details of many specific applications such as the parting of rubber products from molds, and the removal of glass forms from molding machines. The bulletin is illustrated with cartoons and photographs.

High and Low

SEE PAGE 638

RANDALL & STICKNEY

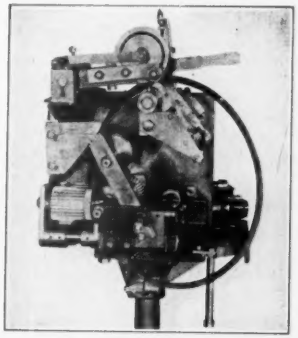
Hand Grip Rubber Gauge No. 3-B

Height	.....9"	Length	.....9¾"	Range	.....½"
Depth of Throat	....6½"	Dia. 50 Divisions Each Div. 1/1000"		Weight	....4 lbs.
				Frame	Aluminum

Designed for gauging stock as it is coming from the calender.

FRANK E. RANDALL CO., Inc., Waltham 54, Mass.

Utility Crimper Type Flipper for Truck and Large Balloon Tires



UTILITY MANUFACTURING COMPANY

Cudahy, Wisconsin

Cable Address: UTILITY-MILWAUKEE

Long Distance Phone Call

MILWAUKEE—SHERIDAN 4-7020

GENERAL LATEX
and
CHEMICAL CORPORATION

Importers and Compounders
Natural and Synthetic

RUBBER LATEX

VULTEX
BUNA N
PLASTISOLS
RESIN EMULSIONS
LATEX COMPOUNDS

General Latex & Chemical Corp.
666 Main St., Cambridge 39, Mass.

General Latex & Chemicals (Canada) Ltd.
Verdun Industrial Bldg., Verdun, Montreal, Que.

Sales Representatives in Principal Cities
Exclusive Agents for sale in USA of
Harrisons & Crosfield Malayan Latex

High Quality
Uniform

PINE TARS	PINE TAR OIL
BURGUNDY PITCH	SOLVENTS
ROSIN OILS	PINE OIL
TACKIFIERS	DIPENTENE

E. W. COLLEDGE
GENERAL SALES AGENT, INC.

P. O. Box 389
Jacksonville, Fla.

52 Vanderbilt Ave.
New York 17, N. Y.

2775 E. 132nd St.
at Shaker Square
Cleveland 20, Ohio

25 E. Jackson Blvd.
Chicago 4, Ill.

503 Market St.
San Francisco 5, Cal.

REVIEWS (CONT'D)

Evaluation of Stabilizers for Vinyl Stocks Containing Chlorowax 40. Diamond Alkali Co., 300 Union Commerce Building, Cleveland 14, Ohio. 8½ x 11 in. 10 pp.

This folder reports the results of a laboratory study of two standard stabilizer formulations. Light stability and heat stability characteristics of each are concisely summarized. Additional information presented in the folder includes a comprehensive table covering chemical composition, approximate per-pound cost, physical form, and specific gravity of some 22 different stabilizers produced under various trade names by 16 manufacturers, and also a list of stabilizers recommended by Diamond for use in compounding vinyl stocks containing Chlorowax 40.

•

Controlled Air-Power Devices. (Bulletin CL-30.) Bellows Co., 222 West Market St., Akron, Ohio. 8½ x 11 in. 24 pp.

This handsomely illustrated bulletin describes the manner in which Bellows "Controlled Air Power" devices are used in many different industrial applications. Specifications of the Bellows Air Motor and design features are presented and fully discussed. Accessories which may be used with the air motor to perform a specific task are also outlined. In addition, the bulletin describes and illustrates the "Power Dome," a standard air cylinder also manufactured by the company. Case histories indicate the savings in both time and money which may be effected through the use of the instruments described.

•

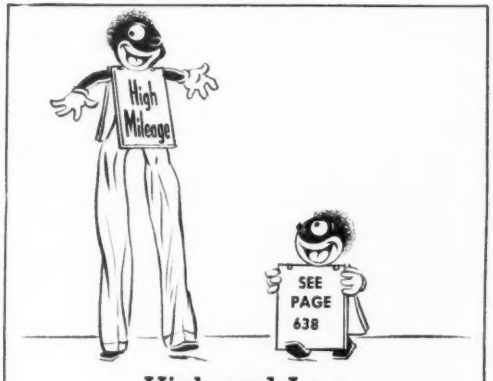
Di-Acro Precision Bending Machines. O'Neil-Irwin Manufacturing Co., Lake City, Minn. 8½ x 11 in. 32 pp.

This booklet describes and illustrates the multitude of bending operations that can easily be accomplished without special engineering knowledge provided a few elementary principles are observed. The different types of bending operations discussed include centered eye bending, circle bending, scroll bending, spring and coil bending, loop and spiral, special set-ups and many others. The various Di-Acro units designed to do these jobs are fully described. Photographs, cross-sectional drawings and diagrams point up the structural features of the units.

•

Flexible Ball Joints. (Catalog No. 215.) Barco Mfg. Co., 1801 W. Winnemac Ave., Chicago 40, Ill. 8½ x 11 in. 16 pp.

Complete specifications, dimensions and application data for the entire line of Barco flexible ball joints are presented in this catalog. Units in various styles and materials are discussed for particular application. Availability as to size and material is also outlined. The catalog is illustrated with photographs and drawings and includes many charts and tables.



High and Low

A LOW COST BUNA N PLASTICIZER

Excellent for LIGHT COLORED PRODUCTS

SPECIFY GRAVITY	0.9440
COLOR, NPA	1½
REFRACTIVE INDEX	1.553
DISTILLATION, °F	580-730
ODOR	Excellent
VISCOSITY, SSU @ 100°F	240

SAMPLES ON REQUEST

PANAFLEX BN-1

PANAFLEX BN-1 is an economical, light-colored plasticizer for synthetic rubber — especially butadiene-acrylonitrile type.

This hydrocarbon plasticizer *completely* replaces dibutyl phthalate in nitrile rubbers—produces soft vulcanizates having high tensile, excellent elongation, and very low modulus. **PANAFLEX BN-1** plasticized stocks possess good ageing properties, superior electrical characteristics, and show good gasoline and oil resistance.

PAN AMERICAN CHEMICALS

PAN AMERICAN CHEMICALS DIVISION
Pan American Refining Corp.
122 EAST 42nd STREET NEW YORK 17, N.Y.
Plant
Texas City, Texas

7 WAYS BETTER

★ Surface Gloss
★ Uniform Caliper
★ Tightly Filled
★ Minimum Surface Load
★ Non-Flaking
★ Pliable
★ Peels Off Clean

Three standard qualities, 20 and 40 inch widths, 100 and 250 yard rolls. Special size rolls to order — write for samples.

BRATEX RUBBER HOLLAND

The HOLLISTON MILLS, INC. Norwood, Massachusetts

MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, MARCH 12, 1951

Natural Rubber

Rubber activities on the New York Commodity Exchange during the past period has still been limited to the liquidation of contracts. Trading activities were suspended from January 26 to February 6. In the 18 trading days in the month of February, the average price of spot rubber was 73.61c. In the previous month, the average price was 71.21c. With few exceptions, rather liberal buying has been taking place from day to day with 76 contracts traded since our last report (February 8).

The government is understood to have made arrangements to purchase approximately 100,000 tons of estate rubber at a reported price of 54c a pound, although reports of the plan have been denied from time to time. Trade circles now believe that the purchase plan will go through with shipments averaging 10,000 tons a month for the balance of the year. Since January 8, the government price for No. 1 Ribbed Smoked Sheet has been about 66c a pound.

Close observers of rubber activities strongly feel that the quantity of rubber in the government stockpile would have been considered more than ample for any eventuality only a year ago, notwithstanding the fact that government stockpile figures have never been publicly announced. While projected goals for the stockpile are somewhat higher than a year ago, it is surmised that the government will purchase additional rubber in a routine manner and at relatively moderate prices.

Today's quotations on the outside market, London and Singapore, follow:

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.70
March	.69
Thin Latex Crepe:	
Spot	.73½
Thin Brown Crepe, No. 2	.64½
Ambers, No. 3	.59
Flat Bark Crepe	.44

London Market
(Standard Smoked Sheets)

April-June	70.29 - 70.58
July-September	63.29 - 63.58

Singapore Market
(Standard Smoked Sheets)

April	58.88 - 59.12

Synthetic Rubber
(Dry Types-Per Pound)

Butaprene NF	.465 - .475
Butaprene NL	.475 - .485
Butaprene NAA	.515 - .525
Butaprene NXM	.550 - .560
Chemigum 30N4NS	.400 - .470
Chemigum 50N4NS	.400 - .470
Chemigum N3	.450 - .520
GR-I	—— - .2075
GR-S	—— - .245
Hycar OR-25	.450 - .460
Hycar OR-15	.520 - .530
Hycar OS-10	.500 - .510
Neoprene Types CG and AC	—— - .500
Neoprene Type E	—— - .650
Neoprene Types FR and KNR	—— - .800
Neoprene Type GN	—— - .380
Neoprene Type GN-A	—— - .380
Neoprene Type RT	—— - .400
Neoprene Type S	—— - .380
Neoprene Type W	—— - .400
Paracril 18	.430 - .450
Paracril 26	.440 - .460
Paracril 35	.510 - .530
Silastic (compounded)	2.35 - 4.40
Thiokol Type A	.370 - .470
Thiokol Type FA	.520 - .620
Thiokol PR-1	.750 - .850
Thiokol Type ST	.750 - .850

Scrap Rubber

Scrap dealers indicate the industry outlook for 1951 is favorable, and demand for scrap is expected to be at high levels throughout the year. Developments in Washington are being closely watched by the trade in the belief that some form of price controls over scrap will be promulgated in the near future. During the past period, numerous export inquiries have been received by the market, but actual orders were few and concentrated on specialty items. Current quotations have been adjusted to reflect market conditions more accurately, as follows:

Mixed passenger tires	ton	$30.00
Beadless truck tires	ton	40.00
Mixed truck tires	ton	33.00
Beadless passenger tires	ton	37.00
No. 1 passenger peelings	ton	80.00
No. 1 truck peelings	ton	80.00
Red passenger tubes	lb.	.20
Black passenger tubes	lb.	.14
Mixed tubes	lb.	.14
No. 2 truck tubes	lb.	.20
Red truck tubes	lb.	.20
Black truck tubes	lb.	.14
Buffings	ton	35.00

Reclaimed Rubber

The market for reclaimed rubber continues at peak levels. Trade sources indicate that government regulations on the consumption of new rubber will force manufacturers to draw heavily on reclaimed rubber to augment their allocations. Therefore, the demand for reclaim is expected to continue strong in the foreseeable future. Current quotations for reclaimed rubber follow:

Tires

Black, Digester (Natural)	lb.	.10½ - .11
Peels No. 1	lb.	.11 - .11½
Whole Tire (Blend)	lb.	.10 - .10½

Inner Tubes

Black (Natural)	lb.	.24 - .25½
Red (Natural)	lb.	.28 - .28½
Butyl	lb.	.12½ - .13

Cotton Tire Fabrics

Most cotton tire fabric suppliers have withdrawn from the market in view of the extremely tight situation. Because of the increasing military demand for tires and subsequently cotton tire fabrics, suppliers see no lessening of the situation in the next few months. Prices as reported below represent estimates of what prices might be on a more fluid market. The quotations follow:

Standard, Peeler, 12/4/2	lb.	.95
Extra Staple, Peeler, 12/4/2	lb.	1.00

Chafers

14.4 oz. (per sq. yard)	lb.	.86½
9.25 oz. (per sq. yard)	lb.	.83
11.65 oz. (per sq. yard)	lb.	.81
8.9 oz. (per sq. yard)	lb.	.83½

Cotton

The market for middling uplands on the Cotton Exchange in New York opened on March 8 after having been closed since January 27 pending clarification of the government's price control order as it applied to cotton. On March 3, the Office of Price Stabilization set a price ceiling of 45.76c which was applicable to spot sales as well as futures but provided for variations depending on location.

On March 6, OPS in an amendment to the March 3 order, set a uniform ceiling price of 45.39c all transactions on the cotton futures markets regardless of the location of the delivery points. The latter amendment still provides for variations for different grades of cotton, and allows a 55c premium for carrying charges, etc.

When the cotton market reopened on March 8, March and May futures immediately rose to the ceiling price of 45.39c. Spot cotton prices moved up to the ceiling levels in most areas, but there was some objection to the pricing regulation in Memphis, for example, where the Exchange refused to re-open. At any rate, the New York Exchange opened with spot prices at 46.00c, and this figure has held until this writing (March 12).

Despite private forecasts that the acreage planted to cotton will fall below government goals, trade circles tend to take a more bearish view of the long range price outlook. In support of this view it was pointed out that while planted acreage may fall somewhat short it will still be far above last year with the 16,000,000 bale goal achieved.

Quotations for middling uplands on the Exchange on March 12, follow:

	High	Low	Close
May	45.39	45.39	45.39
July	44.93	44.73	44.75
Oct.	41.35	40.90	40.95

Closing Rubber Prices on New York Commodity Exchange (No. 1 R.S.S. Contract)

FROM FEBRUARY 8 TO MARCH 12

Feb.	Spot	Mar.	May	July	Sales
8	74.00	74.00	69.50	64.00	12
9	74.00	72.00	67.60	62.00	—
10	—	—	—	—	—
11	—	—	—	—	—
12	—	—	—	—	—
13	74.00	74.50	67.00	63.00	—
14	74.00	73.00	66.25	62.00	—
15	74.00	73.00	66.25	62.00	—
16	74.00	73.88	67.88	63.00	1
17	—	—	—	—	—
18	—	—	—	—	—
19	74.00	75.00	70.25	63.00	—
20	75.00	74.00	71.88	65.00	—
21	74.00	72.50	69.75	61.25	—
22	—	—	—	—	—
23	75.00	74.00	69.00	62.00	5
24	—	—	—	—	—
25	—	—	—	—	—
26	74.00	74.00	67.00	61.00	18
27	74.00	74.00	70.00	63.00	11
28	74.00	74.00	69.50	66.00	5
Mar.					
1	74.00	75.00	70.50	66.50	4
2	74.00	77.00	71.50	67.00	2
3	—	—	—	—	—
4	—	—	—	—	—
5	73.00	77.00	71.00	66.00	3
6	72.00	74.50	69.00	65.50	9
7	72.00	72.00	68.00	62.00	8
8	71.00	70.50	65.50	63.00	—
9	70.00	69.50	64.50	59.00	—
10	—	—	—	—	—
11	—	—	—	—	—
12	70.00	69.00	64.00	59.00	1

EXCLUSIVE AGENTS

RCMA
RAY-BRAND
Centrifuged Latex

REVERTEX
72-75% Latex Concentrate

- Normal Latex
- GR-S Latex Concentrate
- Natural and Synthetic Latex Compounds

We maintain a fully equipped laboratory and free consulting service.

LATEX DIVISION
RUBBER CORPORATION OF AMERICA
274 Ten Eyck Street, Brooklyn 6, N. Y.
111 West Monroe Street, Chicago 3, Ill.

SALES REPRESENTATIVES: Charles Larkin II, 250 Delaware Ave., Buffalo 2, N.Y.; H. L. Blachford Ltd., 977 Aqueduct St., Montreal 3, Canada; Ernesto Del Valle, Tolsa 64, Mexico D.F.

Dependable service on
CHEMICAL DISPERSIONS
for Latex

- Do you buy ready-to-use dispersions of
  SULFUR
  ZINC OXIDE
  ACCELERATORS
  ANTI-OXIDANTS
  or complete curing groups
- Do your transportation charges run higher now than they would from Columbia City, Ind. (near Ft. Wayne)?
- Do you need a source of supply for
  NATURAL CENTRIFUGED LATEX
  GRS No. 4 LATEX NORMAL
  GRS No. 4 LATEX CONCENTRATE

If your answer to any one question is "Yes", TESTWORTH LABORATORIES, INC. can serve you to YOUR advantage.

TESTWORTH TOL LAC Laboratories Inc.
407 SOUTH DEARBORN CHICAGO 5

Stamford
"FACTICE" VULCANIZED OIL
(REG. U. S. PAT. OFF.)

Our products are engineered to fill every need in natural and synthetic rubber compounding wherever the use of vulcanized oil is indicated.

We point with pride not only to a complete line of solid Brown, White, "Neophax" and "Amberex" grades, but also our aqueous dispersions and hydro-carbon solutions of "Factice" for use in their appropriate compounds.

Continuing research and development in our laboratory and rigid production control has made us the leader in this field.

The services of our laboratory are at your disposal in solving your compounding problems.

THE STAMFORD RUBBER SUPPLY CO.
STAMFORD, CONN.
Makers of Stamford "Factice" Vulcanized Oil Since 1900
(Reg. U.S. Pat. Off.)

STATISTICS *Of Interest to the Rubber Industry*

U. S. Imports and Re-Exports of Natural Rubber

	GROSS IMPORTS											
	Natural Rubber (Dry)			Natural Rubber (Latex)			Guayule				RE-EXPORTS		TOTAL NET IMPORTS
Year	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Total Gross Imports Long Tons	Long Tons	Total Declared Value	Long Tons
1936	467,064	152,072,496	14.54	19,852	6,659,899	14.98	1,229	286,552	10.41	488,145	12,581	4,488,223	475,564
1937	574,600	237,307,041	18.44	23,185	10,213,670	19.67	2,694	745,873	12.36	600,479	7,902	3,385,433	592,577
1938	397,640	125,373,864	14.08	11,944	4,168,127	15.58	2,508	628,886	11.19	412,092	5,652	1,799,124	406,440
1939	469,946	167,586,780	15.92	27,437*	10,467,552	17.03	2,233	463,345	9.27	499,616	13,125	5,832,618	486,491
1940	781,202	303,308,823	17.33	33,789	14,593,466	19.28	3,633*	758,007	9.31	818,624	7,060	3,197,136	811,564
1941	989,458	401,976,317	18.14	34,787*	15,965,627	20.48	4,881	1,145,767	10.48	1,029,176	5,376	2,757,872	1,023,800
1942	266,276	112,537,426	18.87	10,646	5,630,667	23.61	5,523	1,660,792	13.42	282,445	10,856	5,913,386	271,589
1943	50,358	31,369,198	27.81	1,890	1,312,202	31.00	7,678*	3,636,789	21.14	59,926	22,583	16,446,707	37,343
1944	103,847	73,908,549	31.77	3,091	2,092,211	30.99	6,701*	3,351,233	22.33	113,639	9,739	8,712,695	103,900
1945	134,408	95,814,102	31.82	4,733	3,115,853	30.22	10,040	5,963,797	26.52	149,221	9,509	7,201,746	139,712
1946	366,415	222,552,939	27.12	8,421	5,843,085	29.14	5,344	2,859,246	23.89	380,180	7,711	5,331,954	372,469
1947	691,087	306,951,814	19.83	17,542	9,787,722	30.98	2,884	1,492,825	23.11	711,513	4,121	2,354,494	707,392
1948	702,293	290,849,177	18.49	32,745	9,820,080	24.93	302	71,330	10.53	735,340	6,672	3,259,324	728,668
1949	630,818	225,341,459	15.95	29,974	14,970,478	22.30	....	.....	....	660,792	6,253	2,746,109	654,539
1949:													
May	51,243	18,827,018	16.40	2,191	1,105,887	22.54	....	.....	....	53,434	390	181,457	53,044
June	49,038	18,084,566	16.47	2,180	1,113,169	22.80	....	.....	....	51,218	471	226,882	50,747
July	43,474	15,502,688	15.76	2,267	1,146,784	22.59	....	.....	....	45,741	699	289,896	45,042
Aug.	46,853	15,828,526	15.08	2,725	1,342,109	21.98	....	.....	....	49,578	251	110,368	49,327
Sept.	43,476	14,009,337	14.45	2,144	1,093,225	22.81	....	.....	....	45,620	556	248,921	45,064
Oct.	44,651	14,678,475	14.66	2,634	1,213,360	20.57	....	.....	....	47,285	404	160,047	46,881
Nov.	63,641	20,693,593	14.51	3,512	1,645,360	20.89	....	.....	....	67,153	11	9,002	67,142
Dec.	63,982	20,770,607	14.49	3,952	1,860,525	21.02	....	.....	....	67,394	689	295,362	67,245
1950:													
Jan.	54,277	17,881,882	14.71	3,974	1,951,793	21.92	....	.....	....	58,251	431	225,196	57,820
Feb.	50,022	17,373,658	15.51	3,336	1,608,163	21.52	..	.....	....	53,358	558	252,013	52,800
Mar.	57,831	21,120,732	16.30	3,650	1,826,747	22.34	....	.....	....	61,481	659	326,688	60,822
Apr.	72,418	27,412,444	16.89	4,393	2,199,149	22.34	175	47,117	12.02	76,988	639	340,781	76,349
May	56,804	21,822,118	17.15	3,183	1,904,513	26.71	200	58,948	13.16	60,187	597	289,551	59,590
June	73,806	31,525,162	19.07	3,965	2,294,158	25.83	105	33,651	14.31	77,876	625	322,008	76,451
July	53,245	27,256,854	20.11	4,225	2,710,430	28.64	70	26,836	17.11	57,540	683	381,650	56,857
Aug.	67,415	36,692,742	23.90	5,253	3,721,184	31.62	35	9,671	12.34	72,703	1,005	914,279	71,698
Sept.	55,981	36,724,072	29.23	5,117	4,369,707	38.12	55	15,148	12.34	61,153	879	798,935	60,274
Oct.	73,205	53,151,003	32.41	5,161	5,485,816	47.46	10	7,496	33.18	78,376	564	500,623	77,812
Nov.	68,462	62,121,636	40.51	4,456	6,227,022	56.71	29	21,618	33.46	72,947	604	724,050	72,343

Source: U. S. Department of Commerce. * Adjusted to agree with total gross imports.

Notes: (1) Figures for latex are on a dry weight basis. (2) Figures for re-exports include natural rubber (dry and latex) and guayule. (3) In the years 1940 through 1943, crepe sole rubber imports were reported under a separate classification. Such imports, which are included under natural rubber, dry above, were: 856,294 pounds, valued at $191,097 in 1940; 379,607 pounds, valued at $85,924 in 1941; 662,503 pounds, valued at $159,530 in 1942; and 21,653 pounds, valued at $5,215 in 1943.

Natural Rubber
(Including Latex and Guayule)

(All Quantities in Long Tons)

Year	New Supply	Consumption	Re-Exports	Stocks On Hand at End of Period
1936	**488,145**	**575,000**	**12,581**	**223,000**
1937	**600,479**	**543,600**	**7,902**	**262,204**
1938	**411,983**	**437,031**	**5,652**	**231,500**
1939	**499,473**	**592,000**	**13,125**	**125,800**
1940	**818,243**	**648,500**	**7,060**	**288,864**
1941	**1,029,007**	**775,000**	**5,376**	**533,344**
1942	**282,653**	**376,791**	**10,856**	**422,714**
1943	**55,329**	**317,634**	**20,815**	**139,594**
1944	**107,834**	**144,113**	**9,665**	**93,650**
1945	**135,672**	**105,429**	**6,743**	**118,715**
1946	**400,687**	**277,597**	**4,338**	**237,467**
1947	**688,354**	**562,661**	**4,101**	**129,038**
1948	**735,227**	**627,332**	**6,673**	**141,541**
1949	**660,792**	**574,522**	**6,253**	**106,619**
1950	**805,459**	**714,279**	**7,794**	**87,739**
1949:				
June	51,218	47,117	471	103,626
July	46,277	40,597	699	103,017
Aug.	49,579	45,307	251	99,850
Sept.	45,620	43,978	556	100,618
Oct.	47,285	51,243	404	90,733
Nov.	67,152	52,093	701	99,208
Dec.	67,934	52,919	713	106,619
1950:				
Jan.	58,251	59,992	431	108,769
Feb.	53,393	56,580	558	104,477
Mar.	61,481	60,859	659	101,691
Apr.	76,998	57,914	639	106,124
May	60,699	63,813	597	100,776
June	77,876	63,333	625	99,457
July	61,660	61,402	683	93,653
Aug.	72,973	64,297	1,005	87,146
Sept.	61,148	61,281	879	87,409
Oct.	78,376	69,178	564	83,215
Nov.	73,393	51,340	604	81,658
Dec.	69,211	44,290	550	87,739

Source: 1936-40, U. S. Department of Commerce; 1941 to date, Rubber Division, OMD, and Predecessor Agencies.

U.S. Gross Imports of Balata, Jelutong, Gutta-Percha, etc.

(All Quantities in Long Tons)

	Balata		Jelutong		Gutta-Percha & Other Guttas	
Year	Tons	Value	Tons	Value	Tons	Value
1936	535	199,368	6,163	1,296,364	1,568	555,643
1937	354	151,344	7,109	2,017,786	1,122	440,894
1938	509	181,140	9,132	2,944,504	444	204,582
1939	694	265,553	6,640	1,603,418	1,740	539,255
1940	648	300,500	7,451	2,449,137	2,340	1,004,885
1941	924	489,514	8,821	2,954,001	1,783	607,025
1942	1,544	1,107,059	1,200	530,296	804	525,763
1943	1,047	708,701	35	14,840	....	.....
1944	1,012	660,805	86	45,578	10	4,999
1945	1,361	907,253	....	.....	36	21,970
1946	2,281	2,233,065	304	256,169	423	458,064
1947	1,982	2,276,531	2,878	1,496,887	392	779,591
1948	1,195	805,078	3,401	2,377,765	423	542,788
1949	1,391	814,554	1,043	834,978	197	189,021
1949:						
May	103	60,361	85	83,391	..	.....
June	44	20,821	74	47,515	27	16,292
July	164	78,112	46	37,403	5	3,391
Aug.	137	66,002	114	96,509	5	2,218
Sept.	208	122,732	91	74,605	22	31,672
Oct.	222	142,538	123	92,681	19	15,221
Nov.	77	68,678	160	89,806	34	28,559
Dec.	54	36,980	108	67,702	39	24,061
1950:						
Jan.	61	42,855	37	18,398	56	35,288
Feb.	42	24,040	162	123,570	30	20,291
Mar.	90	66,374	113	97,008	17	13,672
Apr.	68	45,844	246	211,744	30	23,369
May	78	50,093	114	103,796	69	86,151
June	143	74,936	120	104,123	49	112,902
July	109	53,480	118	101,258	64	87,284
Aug.	171	102,985	234	200,912	46	41,790
Sept.	119	102,475	175	146,493	37	59,004
Oct.	372	311,959	174	132,632	64	146,707
Nov.	735	588,135	214	183,907	51	102,599

Source: U. S. Department of Commerce.

Rubber

Natural – Synthetic

DEPENDABILITY

Particularly during these critical times, those who buy rubber realize how much *"know how"* and *dependability* count in the relationship between supplier and consumer.

With our years of experience perhaps we can be of service to you — write or phone us — no obligation.

S. J. PIKE & CO., INC.

30 CHURCH STREET · NEW YORK 7, N.Y.

CABLE ADDRESS "PIKESID, N. Y." TWX-NY 1-3214 TELEPHONE COrtlandt 7-1584-5-6

In Akron: Tanney-Costello, Inc. 868 E. Tallmadge Ave. Blackstone 4148

In Los Angeles: George Steinbach Merit Western Company 1248 Wholesale St. Tucker 8851

Trade Mark

HEVEATEX

CORPORATION

78 GOODYEAR AVENUE

MELROSE 76, MASS.

BRANCHES: CHICAGO, ILL. AKRON, O. DETROIT, MICH. LOS ANGELES, CAL.

Natural and Synthetic

Latex and Latex Compounds

for all purposes

Synthetic Rubber—Totals

(GR-S, Neoprene, Butyl, and Buna N Types)

(All Quantities in Long Tons)

Year	Production	Imports	Consumption	Exports	Stocks On Hand at End of Period
1941	8,383	.....	6,259	572	1,702
1942	22,434	.....	17,651	1,419	4,612
1943	231,722	.....	170,891	18,148	41,568
1944	762,630	11,043	566,670	104,266	142,927
1945	820,373	10,407	693,580	83,778	203,454
1946	740,026	7,709	761,699*	72,920	114,963
1947	508,702	1,093	559,566	11,385	62,366
1948	488,343	15,671	442,072	4,874	115,111
1949	393,690	17,242	390,855	6,483	98,042
1950	475,984	25,722	506,297	7,450	54,509
1950:					
Apr.	34,821	2,302	35,639	711	83,440
May	37,320	2,762	43,866	620	74,524
June	38,569	2,433	46,001	622	65,346
July	43,820	2,239	41,351	707	67,085
Aug.	43,950	2,618	47,950	627	63,654
Sept.	44,460	1,947	47,268	629	59,059
Oct.	44,525	1,584	52,741	667	51,751
Nov.	48,423	1,971	46,484	578	51,636
Dec.	53,873	1,603	50,241	545	54,509

Source: Rubber Division, OMD, and Predecessor Agencies.
Notes: (1) These figures are revised from time to time and the latest available issue should be consulted for the most accurate data. (2) Figures shown include the output of both government and privately-owned plants. (3) Figures for 1941 are estimated. * Includes year-end adjustment of 5,384 tons to cover non-reporting companies.

Synthetic Rubber—By Type

(All Quantities in Long Tons)

New Supply

	GR-S (Buna S)	GR-M (Neoprene)	GR-I (Butyl)	Buna N Types	Total
1943	182,259	33,603	1,373	14,487	231,722
1944	679,949	56,660	20,252	16,812	773,673
1945	724,859	45,672	52,378	7,871	830,780
1946	613,408	47,766	80,823	5,738	747,735
1947	408,858	31,495	62,824	6,618	509,795
1948	405,492	34,848	56,662	7,012	504,014
1949	310,599	35,215	54,046	11,072	410,932
1950	378,687	50,067	60,915	12,037	501,706

Consumption

1943	131,977	26,205	304	12,405	170,891
1944	495,552	46,243	10,763	14,112	566,670
1945	600,145	42,394	43,012	8,029	693,580
1946	632,126	44,357	79,228	5,988	761,699
1947	448,589	37,703	68,838	4,536	559,666
1948	345,313	32,118	58,870	5,771	442,072
1949	299,420	31,753	50,855	8,827	390,855
1948	345,313	32,118	58,870	5,771	430,618
1949	299,420	31,753	50,855	8,827	397,139
1950	412,578	42,472	66,237	10,720	506,297

Exports

1943	14,937	2,540	40	631	18,148
1944	98,380	4,799	530	557	104,266
1945	76,555	5,837	980	406	83,778
1946	68,763	2,642	495	797	72,697
1947	7,951	2,617	62	755	11,385
1948	1,093	2,875	21	885	4,874
1949	1,401	3,330	178	1,574	6,483
1950	855	4,695	31	1,869	7,450

Stocks at End of Period

1943	30,975	6,415	1,033	3,145	41,568
1944	116,130	11,739	9,892	5,166	142,927
1945	170,571	9,703	18,378	4,802	203,454
1946	81,483	10,470	19,478	3,755	115,186
1947	40,606	5,237	13,184	3,339	62,366
1948	96,282	5,072	10,995	2,762	115,111
1949	77,731	4,654	12,224	3,433	98,042
1950	38,436	5,382	7,990	2,701	54,509

Source: Rubber Division, OMD, and Predecessor Agencies.
Notes: (1) These figures are revised from time to time and the latest available issue should be consulted for the most accurate data. (2) Figures for GR-M and Buna N Types include production of privately-owned plants.

Gasoline Consumption

(In Thousands of Barrels of 42 Gallons)

	1943	1944	1945	1946	1947	1948	1949	1950
Jan.	36,085	47,540	52,008	51,746	57,057	61,308	63,125	66,908
Feb.	36,274	47,754	48,856	47,654	50,551	56,487	57,980	63,366
Mar.	41,586	52,263	55,364	56,703	59,947	68,171	73,282	78,739
Apr.	48,172	50,005	59,024	62,111	64,140	72,183	75,318	80,348
May	49,828	54,230	60,748	66,800	70,865	77,186	81,065	89,033
June	53,325	54,266	60,580	63,247	71,329	78,044	83,374	90,010
July	47,867	55,119	66,170	60,076	73,441	81,428	82,129	91,707
Aug.	51,880	55,618	70,058	66,729	72,089	80,351	84,707	94,537
Sept.	49,707	56,318	64,529	62,268	71,384	76,159	80,832	86,766
Oct.	53,111	55,154	55,708	66,037	73,277	75,164	79,327	89,126
Nov.	50,703	54,967	53,543	61,345	64,158	72,560	76,346	82,718
Dec.	48,695	52,280	49,745	61,101	67,506	72,162	75,628	80,994
Total	568,238	633,482	696,333	735,417	795,015	871,270	913,713	994,412

Source: U. S. Bureau of Mines.

Reclaimed Rubber

(Including Natural and Synthetic)

(All Quantities in Long Tons)

Year	Production	Consumption—Tons	Consumption—% to Crude [a]	Exports	Stocks On Hand at End of Period
1936	150,571	141,486	24.6	7,085	19,000
1937	185,033	162,000	29.8	13,233	28,800
1938	122,400	120,800	27.6	7,403	23,000
1939	186,000	170,000	28.7	12,611	25,250
1940	208,971	190,244	29.3	11,347	32,636
1941	274,202	251,231	32.2	13,851	41,750
1942	286,007[b]	254,820	64.6	30,405	42,532
1943	304,058[c]	291,082	59.6	15,678	46,201
1944	260,631[d]	251,083	35.3	11,800	43,832
1945	243,309	241,036	30.2	13,413	28,155
1946	295,612	275,410	26.5	14,461	33,666
1947	291,395	288,395	24.8	14,556	35,943
1948	266,861	261,113	24.4	11,428	32,630
1949	224,029	226,679	22.5	10,637	28,263
1950	213,381	202,631	24.3	11,399	34,359
1950:					
Jan.	19,472	20,106	21.4	902	27,319
Feb.	20,474	19,741	22.2	790	27,256
Mar.	23,137	22,151	22.5	988	27,602
Apr.	22,716	21,318	22.2	982	28,352
May	24,879	24,158	21.9	881	27,837
June	25,960	25,253	22.7	889	28,470
July	24,347	23,377	22.2	864	30,371
Aug.	27,640	26,151	22.8	900	31,793
Sept.	29,749	29,250	26.4	1,177	33,395
Oct.	32,710	32,785	26.5	989	33,530
Nov.	30,265	30,260	31.3	1,237	33,960
Dec.	32,003	29,081	30.2	1,000	34,359

Source: 1936-40, Department of Commerce; 1941 to date, Rubber Division, OMD, and Predecessor Agencies.
Notes: (1) These figures are revised from time to time and the latest available issue should be consulted for the most accurate data. [a] Includes natural and synthetic rubber. [b] Includes 893 tons of imports. [c] Includes 67 tons of imports. [d] Includes 21 tons of imports.

Automobile Production in U. S.

(Civilian Production Only)

Year	Passenger Cars	Trucks	Total	Year	Passenger Cars	Trucks	Total
1931	1,973,090	416,648	2,389,738	1941	3,744,500	875,381	4,619,681
1932	1,135,491	235,187	1,370,678	1942	220,814	133,083	353,897
1933	1,573,512	346,545	1,920,057	1943	0	4,501	4,501
1934	2,177,919	575,192	2,753,111	1944	0	124,819	124,819
1935	3,252,244	694,690	3,946,934	1945	83,792	313,643	397,435
1936	3,669,528	781,862	4,451,390	1946	2,148,699	930,760	3,079,459
1937	3,915,889	892,382	4,808,271	1947	3,558,178	1,220,634	4,778,812
1938	2,000,985	485,852	2,486,837	1948	3,909,270	1,363,856	5,273,126
1939	2,866,796	704,308	3,571,104	1949	5,108,841	1,123,736	6,232,577
1940	3,692,328	721,637	4,413,965	1950	6,665,836	1,332,263	7,998,099
1950:							
Jan.	487,824	93,323	581,147	July	595,067	111,028	706,095
Feb.	385,361	89,971	475,332	Aug.	682,782	134,853	817,635
Mar.	469,618	110,843	580,461	Sept.	616,827	105,562	722,389
Apr.	455,193	103,850	559,043	Oct.	651,169	108,815	723,984
May	575,518	120,963	696,481	Nov.	504,445	98,538	602,983
June	720,688	135,332	856,020	Dec.	521,371	118,890	640,261
1951:							
Jan.	478,589	93,319	571,908	July	.....	.....	.....
Feb.	.....	.....	.....	Aug.	.....	.....	.....
Mar.	.....	.....	.....	Sept.	.....	.....	.....
Apr.	.....	.....	.....	Oct.	.....	.....	.....
May	.....	.....	.....	Nov.	.....	.....	.....
June	.....	.....	.....	Dec.	.....	.....	.....

Source: Automobile Manufacturers Association.
Note: Figures are based on factory sales. Revisions are made from time to time in these figures and the latest issue should be consulted for accuracy.

Rim Production

	1946	1947	1948	1949	1950
Passenger Car	15,058,469	21,346,004	23,842,796	27,715,344	35,096,404
Truck & Bus	5,939,244	7,737,353	6,920,231	4,238,174	6,625,129
Agricultural	1,735,992	2,633,699	3,140,882	2,695,430	2,853,483
Earth Mover	5,520	10,610	13,330	9,895	15,602
Total	22,739,225	31,727,666	33,917,239	34,658,843	44,590,618

	1950			1951	
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Passenger Car	3,265,580	3,558,060	2,812,285	2,508,918	2,741,867	2,667,575
Truck & Bus	574,479	612,015	511,990	587,197	620,562	515,761
Agricultural	200,334	172,224	207,037	261,427	306,524	265,807
Earth Mover	2,134	1,798	911	1,893	1,751	4,152
Total	4,042,527	4,344,097	3,532,223	3,359,435	3,670,704	3,453,295

Source: The Tire & Rim Association, Inc.

RUBBER

CRUDE AND
SYNTHETIC

★

Sole Distributor
DUNLOP CENTRIFUGED LATEX
North • South • Central • America

Sole U.S. Distributor
SYNTHETIC LATICES for
POLYMER CORPORATION LTD.
Sarnia, Ont., Canada

★

In Mexico:
COMERCIAL TROPICAL, S.A.
Mexico City

AKRON
BOSTON
LOS ANGELES
TORONTO

CHARLES T. WILSON CO., INC.
120 WALL ST., NEW YORK 5, N. Y.

★

MAKES YOUR WATER
RUSTPROOF
A SUPERIOR SOLVENT
WETTING AGENT

IMMUNOL

ODORLESS . . . NEUTRAL . . . NON-INFLAMMABLE

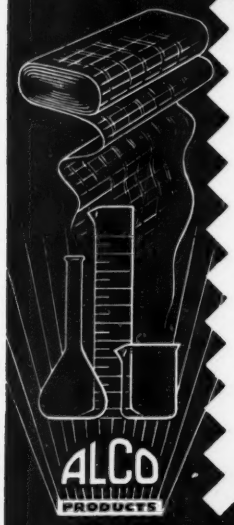
A clear, odorless liquid added to any kind of water immunizes it against rusting. IMMUNOL solutions replace petroleum and other solvents for cleaning metals, plastics, woodwork, etc. and at the same time impart "wetting action"—all at lower cost and in most cases higher efficiency.

IMMUNOL makes a solution so mild that it will not irritate the skin nor will it affect paints, varnish, etc. Parts are protected by an invisible film that can be painted or lacquered over without removal.

For Booklet Write

Haas MILLER Corp.

4th & Bristol Sts. Philadelphia 40, Pa.



VULCANOL*

A Group of Latex Compounds for Sizing, Coating and Impregnating Textile Fabrics.

ALCOGUM

Synthetic Thickeners for Latex Compounds

VULCARITE

Dispersions of Latex Compounding Chemicals

★ ★ ★

Technical information and samples available promptly upon request.

* Registered Trademark

ALCO OIL & CHEMICAL CORPORATION
TRENTON AVE. and WILLIAM ST., PHILADELPHIA 34, PA.

SOUTHERN DISTRIBUTORS
WICA COMPANY INC.
CHARLOTTE, N.C.

Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1938 (total)	**11,516**	**30,567**	**1,049**	**43,132**	**40,907**	**8,451**
Passenger Car.	**10,086**	**27,104**	**580**	**37,770**	**35,789**	**6,937**
Truck and Bus	**1,430**	**3,463**	**469**	**5,362**	**5,118**	**1,514**
1939 (total)	**18,208**	**38,022**	**1,279**	**57,509**	**57,613**	**8,665**
Passenger Car.	**15,742**	**33,471**	**607**	**49,820**	**49,933**	**7,108**
Truck and Bus	**2,466**	**4,551**	**672**	**7,689**	**7,680**	**1,557**
1940 (total)	**22,252**	**35,346**	**1,176**	**58,774**	**59,186**	**9,127**
Passenger Car.	**19,560**	**30,903**	**411**	**50,874**	**50,965**	**7,270**
Truck and Bus	**2,692**	**4,443**	**765**	**7,900**	**8,221**	**1,857**
1941 (total)	**24,780**	**39,895**	**1,489**	**66,164**	**61,540**	**4,436**
Passenger Car.	**19,855**	**34,119**	**586**	**54,560**	**50,392**	**3,165**
Truck and Bus	**4,925**	**5,776**	**903**	**11,604**	**11,148**	**1,271**
1942 (total)	**6,680**	**8,872**	**207**	**15,759**	**15,351**	**6,247**
Passenger Car.	**910**	**2,734**	**38**	**3,682**	**2,790**	**4,432**
Truck and Bus	**5,770**	**6,138**	**169**	**12,077**	**12,561**	**1,815**
1943 (total)	**6,128**	**18,547**	**225**	**24,900**	**20,423**	**1,883**
Passenger Car.	**82**	**10,606**	**71**	**10,759**	**7,620**	**1,132**
Truck and Bus	**6,046**	**7,941**	**154**	**14,141**	**12,803**	**751**
1944 (total)	**6,654**	**26,439**	**263**	**33,356**	**33,446**	**2,013**
Passenger Car.	**208**	**18,330**	**130**	**18,668**	**18,819**	**1,218**
Truck and Bus	**6,446**	**8,109**	**133**	**14,688**	**14,627**	**795**
1945 (total)	**5,984**	**36,479**	**504**	**42,967**	**44,524**	**3,077**
Passenger Car.	**1,115**	**25,463**	**222**	**26,800**	**28,200**	**2,214**
Truck and Bus	**4,869**	**11,016**	**282**	**16,167**	**16,324**	**863**
1946 (total)	**15,310**	**65,490**	**1,512**	**82,312**	**82,298**	**2,448**
Passenger Car.	**11,086**	**54,684**	**653**	**66,423**	**66,466**	**1,763**
Truck and Bus	**4,224**	**10,806**	**859**	**15,889**	**15,832**	**685**
1947 (total)	**25,056**	**62,871**	**3,256**	**91,183**	**95,550**	**6,949**
Passenger Car.	**19,644**	**52,857**	**1,608**	**74,109**	**77,795**	**5,444**
Truck and Bus	**5,412**	**10,014**	**1,648**	**17,074**	**17,755**	**1,505**
1948 (total)	**26,845**	**49,148**	**1,787**	**77,781**	**81,314**	**10,698**
Passenger Car.	**21,589**	**41,295**	**656**	**63,540**	**66,738**	**8,773**
Truck and Bus	**5,256**	**7,853**	**1,132**	**14,241**	**14,576**	**1,925**
1949 (total)	**31,584**	**43,466**	**1,467**	**76,517**	**76,369**	**10,638**
Passenger Car.	**28,129**	**36,440**	**509**	**65,077**	**65,140**	**8,904**
Truck and Bus	**3,456**	**7,026**	**958**	**11,440**	**11,228**	**1,734**
1950 (total)	**41,350**	**57,051**	**1,425**	**99,826**	**92,750**	**3,770**
Passenger Car	**36,684**	**47,321**	**653**	**84,658**	**78,622**	**3,033**
Truck and Bus	**4,666**	**9,730**	**772**	**15,168**	**14,128**	**737**
1950:						
Oct. (total)	3,782	4,774	152	8,709	8,659	4,382
Passenger Car.	3,389	3,877	74	7,340	7,314	3,483
Truck and Bus	393	897	78	1,369	1,345	899
Nov. (total)	3,213	4,140	151	7,504	7,513	4,454
Passenger Car.	2,853	3,316	78	6,247	6,327	3,596
Truck and Bus	360	825	73	1,257	1,187	858
Dec. (total)	3,245	4,199	130	7,753	6,811	3,770
Passenger Car.	2,801	3,395	67	6,263	5,636	3,033
Truck and Bus	443	804	62	1,310	1,175	737

Source: The Rubber Manufacturers Association, Inc.

Cotton, Rayon and Nylon Tire Fabrics

(Production in Thousands of Pounds)

	Cotton				Rayon and Nylon[b]		
	Tire Cord Not Woven	Cord Fabric Woven	Chafer and All Other Tire Fabrics	Total	Tire Cord Not Woven	Tire Cord And Other Tire Fabrics	Total
1947:							
Jan.-Mar.	**21,972**	**49,377**	**21,815**	**93,164**	**5,322**	**52,059**	**57,381**
Apr.-June	**23,491**	**53,746**	**16,480**	**93,717**	**5,486**	**47,360**	**52,846**
July-Sept.	**15,571**	**44,291**	**14,596**	**74,458**	**6,161**	**51,719**	**57,880**
Oct.-Dec.	**18,183**	**48,532**	**17,762**	**84,477**	**6,550**	**55,078**	**61,628**
Total	**79,217**	**195,946**	**70,653**	**345,816**	**23,519**	**206,216**	**229,735**
1948:							
Jan.-Mar.	**18,546**	**50,251**	**19,391**	**88,188**	***a***	**60,569**	**60,569**
Apr.-June	**15,585**	**45,385**	**18,213**	**79,183**	***a***	**59,759**	**59,759**
July-Sept.	29,743	45,927	*c*	75,670	*a*	63,642	63,642
Oct.-Dec.	13,321	34,424	15,879	63,624	*a*	65,258	65,258
Total	77,195	175,987	53,483	306,665	.....	249,228	249,228
1949:							
Jan.-Mar.	*d*	33,213	25,395	56,608	*a*	68,296	68,926
Apr.-June	5,309	29,114	13,617	48,040	*a*	68,269	68,269
July-Sept.	1,343	16,620	11,141	29,104	15,640	55,969	71,609
Oct.-Dec.	180	17,650	11,886	29,716	12,967	58,890	72,857
Total	6,832	96,597	62,039	163,468	28,607	251,424	281,661
1950:							
Jan.-Mar.	3,939	19,210	12,948	36,097	12,469	60,981	73,450
Apr.-June	11,077	29,498	14,071	54,646	11,510	59,966	71,476
July-Sept.	10,529	39,792	15,041	65,092	13,161	61,614	74,775
Oct.-Dec.	.....	.....	.....	.....	.....	.....	.....
Total	.....	.....	.....	.....	.....	.....	.....

Source: U. S. Bureau of the Census.

Notes: (a) Included with tire cord and fabrics to avoid disclosures of operations of individual mills. (b) Fuel cell fabrics are not included with rayon and nylon tire cord and fabrics. (c) Included with tire cord not woven. (d) Included with chafer and all other tire fabrics.

Automotive Inner Tubes

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1936	21,514	32,188	721	54,423	57,036	10,945
1937	22,464	29,554	749	52,767	52,373	10,312
1938	11,515	28,134	644	40,293	37,848	8,166
1939	18,190	31,998	1,002	51,190	50,649	7,036
1940	22,172	29,070	972	52,214	52,237	7,017
1941	24,722	33,749	1,232	59,703	57,433	4,686
1942	6,895	7,213	159	14,267	12,685	6,206
1943	6,350	12,474	189	19,014	15,014	2,626
1944	6,460	20,569	196	27,224	27,488	2,813
1945	5,988	33,906	411	40,304	41,742	3,627
1946	15,327	59,357	1,424	76,108	77,251	3,820
1947	25,046	46,560	2,483	74,088	79,181	8,059
1948	26,833	40,548	1,119	68,499	70,033	9,641
1949	31,521	31,450	887	63,858	65,114	10,657
1950	41,344	42,097	825	84,266	80,613	6,608
1950:						
Aug.	4,095	5,048	66	9,209	7,244	6,619
Sept.	3,807	3,682	67	7,556	7,074	6,129
Oct.	3,782	3,542	93	7,418	7,988	6,400
Nov.	3,213	2,831	91	6,135	6,713	6,963
Dec.	3,247	3,089	87	6,423	6,111	6,608

Source: The Rubber Manufacturers Association, Inc.

Smoked Sheets—Spot Closing Prices

(New York Market—Cents per pound)

Year	High	Low	Avg.	Year	High	Low	Avg.
1910	288	141	206.60	1931	8½	4½	6.17
1911	184	114	141.30	1932	4¾	2½	3.49
1912	140	108	121.60	1933	9⅜	2⅜	5.96
1913	113	59	82.04	1934	15⅞	8¾	12.92
1914	93	56	65.33	1935	13¾	10½	12.37
1915	79	58½	65.85	1936	23	13⅝	16.41
1916	102	55	72.50	1937	26⅞	14	19.39
1917	90	52	72.23	1938	17⅞	10¼	14.64
1918	70	40	60.15	1939	24	14⅛	17.57
1919	57	38½	48.70	1940	24	18¾	20.10
1920	56½	16	36.30	1941	24⅞	19½	22.40
1921	21¾	11½	16.36	1942	22½	22½	22.50
1922	28⅜	13⅝	17.50	1943	22½	22½	22.50
1923	37⅛	24¾	29.45	1944	22½	22½	22.50
1924	40⅛	17⅜	26.20	1945	22½	22½	22.50
1925	121	34⅜	72.46	1946	22½	22½	22.50
1926	88½	36¾	48.50	1947	25	14	20.00
1927	41¾	33	37.72	1948	25	18	21.99
1928	41⅜	17	22.48	1949	19¼	15⅞	17.57
1929	26⅞	15½	20.55	1950	86	18	41.10
1930	16½	7½	11.98				

Note: Price was fixed by Government on August 6, 1941, at 22½c a pound for non-war uses. Free trading was resumed May 1, 1947.

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market—in Cents)

Average Monthly Price Per Pound

	1944	1945	1946	1947	1948	1949	1950	1951
Jan.	20.76	22.36	25.49	32.58	36.09	33.37	31.89	45.04
Feb.	21.34	22.29	26.57	33.91	33.63	33.41	32.79	(a)
Mar.	21.65	22.43	27.52	35.89	35.04	33.44	32.65	.....
Apr.	21.71	21.88	28.40	35.89	38.10	33.84	33.23	.....
May	21.63	23.30	28.17	36.51	38.57	33.73	33.64	.....
June	23.31	23.42	29.89	37.83	38.12	33.56	34.61	.....
July	22.33	23.27	34.11	38.03	34.89	32.99	38.11	.....
Aug.	22.11	23.10	36.31	34.83	32.23	32.06	38.93	.....
Sept.	22.10	23.25	37.59	32.21	31.92	30.94	41.62	.....
Oct.	22.32	23.85	36.79	32.39	32.01	30.32	40.66	.....
Nov.	22.13	24.71	31.50	34.50	32.15	30.52	43.11	.....
Dec.	22.28	25.21	33.03	36.74	32.90	31.08	43.37	.....
Average for Year	21.89	23.25	31.28	35.11	34.64	32.44	37.05	....

Note: The Government established a ceiling price of 45.76c for spot cotton on March 3, 1951. (a) Trading suspended during February.

Consumption of Vinyl Resins

(In Thousands of Pounds)

	Sheeting and Film [a]	Textile and Paper Coating Resins [b]	Molding and Extrusion Materials [b]	All Other [b, c]
1946	52,080	11,673	61,852	27,083
1947	66,430	17,237	73,114	27,064
1948	**98,021**	**31,085**	**73,598**	**21,147**
1949	157,544	29,470	81,842	19,792
1950	227,149	46,044	113,889	21,868
1950:				
Aug.	19,389	4,073	8,942	1,878
Sept.	18,498	3,682	9,309	1,832
Oct.	21,622	4,212	9,927	2,025
Nov.	16,683	4,215	9,981	1,897
Dec.	19,338	4,377	10,926	1,537

Source: Bureau of the Census.

Notes: (a) Includes weight of fillers, plasticizers, extenders and safety glass sheeting; (b) Resin content; (c) Includes Adhesives, but excludes data for protective coating resins.

RIDACTO

"The Proven Accelerator Activator Since 1944"

For Use With—
THIAZOLES • THIURAMS • DITHIOCARBAMATES

You can improve your position in present accelerator market by using Ridacto and reducing dosage of primary accelerators.

The SPENCER PRODUCTS CO.
P. O. Box 339 Ridgewood, New Jersey

GUMMI UND ASBEST

Covering the Rubber, Asbestos, and Synthetics Industries

Read by all important plant personnel in more than ten European countries . . . the Advertising Medium of all firms interested in rubber imports and exports. Send for sample copy and advertising rates.

Annual Subscription (Including Postage) — $4.00

A. W. GENTNER VERLAG
14a Stuttgart, Germany (American Zone)

D P R*

DEPOLYMERIZED RUBBERS

Produced in a range of flowable consistencies

Uniform Quality

Laboratory Controlled

Samples and data upon request

H. V. HARDMAN CO.
INCORPORATED
571 Cortlandt St., Belleville 9, N. J.

C RUBBER U D E

Synthetic Rubber
Liquid Latex

•

THE SOUTH ASIA CORP.

Importers-Dealers Crude Rubber
11 BROADWAY, NEW YORK, N. Y.
Digby 4-2050

BROADSTREET BANK BLDG.
TRENTON 8, NEW JERSEY
TRenton 2-8519

HYDROCARBON M. R.

GRANULATED
CRUSHED
SOLID

TUMPEER CHEMICAL CO.
333 NORTH MICHIGAN AVENUE
CHICAGO 1, ILLINOIS

Rubber Industry Employment, Wages and Hours

All Rubber Products

Mo.	1949 Production Workers (thousands)	1949 Average Weekly Earnings	1949 Average Weekly Hours	1949 Average Hourly Earnings	1950 Production Workers (thousands)	1950 Average Weekly Earnings	1950 Average Weekly Hours	1950 Average Hourly Earnings
Jan.	201	$56.89	37.9	$1.501	187	$60.52	39.4	$1.536
Feb.	197	56.55	37.7	1.500	188	59.90	39.2	1.528
Mar.	194	55.43	37.0	1.498	189	59.70	39.3	1.519
Apr.	190	55.50	36.9	1.504	191	61.76	40.0	1.544
May	185	57.08	37.7	1.514	194	64.52	41.2	1.566
June	181	58.29	38.2	1.526	199	65.08	41.4	1.572
July	177	58.37	38.4	1.520	200	65.59	41.2	1.592
Aug.	180	57.72	38.3	1.507	208	66.25	41.8	1.585
Sept.	167	60.97	40.3	1.513	215	66.58	41.9	1.589
Oct.	187	59.57	39.4	1.512	219	67.34	42.3	1.592
Nov.	186	57.91	38.4	1.508	221	67.66	42.0	1.611
Dec.	187	59.04	39.2	1.506	222	....	..	....

Tires and Tubes

Jan.	91.3	60.72	35.3	1.720	82.6	67.70	38.4	1.763
Feb.	89.4	60.99	35.4	1.723	83.1	67.22	38.3	1.755
Mar.	88.6	61.50	35.8	1.718	83.4	65.26	37.4	1.745
Apr.	88.6	60.92	35.4	1.721	84.0	69.23	39.0	1.775
May	87.2	63.20	36.3	1.741	85.9	74.60	41.1	1.815
June	86.3	64.09	36.6	1.751	88.0	74.05	40.6	1.824
July	82.0	64.45	36.6	1.761	88.3	75.22	40.4	1.862
Aug.	80.9	62.32	36.0	1.731	89.6	76.01	40.8	1.863
Sept.	64.3	70.03	39.1	1.791	91.7	75.46	40.9	1.845
Oct.	81.1	64.83	37.3	1.738	91.6	75.32	41.0	1.837
Nov.	81.3	63.91	36.9	1.732	93.1	75.95	40.9	1.857
Dec.	82.1	64.79	37.3	1.737	...	....	...	....

Rubber Footwear

Jan.	24.8	51.86	40.2	1.290	20.1	45.87	35.7	1.285
Feb.	22.9	48.15	37.5	1.284	18.8	43.06	34.2	1.259
Mar.	21.9	42.07	33.6	1.252	19.4	51.04	40.0	1.276
Apr.	21.4	46.65	37.2	1.254	19.3	50.36	39.5	1.275
May	20.5	49.45	38.9	1.257	19.1	50.20	39.4	1.274
June	19.8	50.35	39.4	1.278	19.3	52.07	40.3	1.292
July	20.2	48.84	38.7	1.262	19.2	52.13	39.7	1.313
Aug.	20.3	48.78	38.9	1.254	20.7	53.93	41.9	1.287
Sept.	21.1	51.71	40.4	1.280	21.8	53.95	41.5	1.300
Oct.	21.5	49.81	39.1	1.274	22.8	56.00	42.2	1.327
Nov.	22.2	50.51	39.9	1.266	23.3	54.52	42.1	1.295
Dec.	22.1	50.23	39.8	1.262	...	....	...	....

All Other Rubber Products

Jan.	85.3	54.38	40.2	1.356	84.5	57.04	41.3	1.381
Feb.	85.1	54.05	40.1	1.348	86.3	56.43	41.1	1.373
Mar.	83.1	52.49	39.2	1.339	86.2	56.16	40.9	1.373
Apr.	79.6	51.69	38.4	1.346	87.2	57.13	41.1	1.390
May	77.2	52.51	39.1	1.343	88.8	57.92	41.7	1.389
June	75.3	53.85	39.8	1.353	92.0	59.23	42.4	1.397
July	74.5	54.11	40.2	1.346	92.8	59.08	42.2	1.400
Aug.	78.6	52.46	40.6	1.366	98.0	60.13	42.8	1.405
Sept.	81.4	56.28	41.2	1.366	101.0	61.30	42.9	1.429
Oct.	84.4	57.06	41.5	1.375	104.1	62.67	43.4	1.444
Nov.	82.8	54.04	39.5	1.368	104.7	63.15	42.9	1.472
Dec.	83.1	55.66	40.9	1.361	...	....	...	....

Source: U. S. Departments of Commerce and Labor.

Note: Data are based upon reports from cooperating establishments covering both full and part-time employees who worked during or received pay for the pay period ending nearest the 15th of the month. The employment series have been adjusted to levels indicated by Federal Security Agency data for 1947, and have been carried forward from 1947 bench-mark levels, thereby providing consistent series. Hours and earning data pertain only to production and related workers.

Production Index for the Rubber Industry

Production 1935-1939 = 100

(Based on man-hours)

	1948	1949	1950		1948	1949	1950
Jan.	223	193	194	July	200	175	222
Feb.	215	188	195	Aug.	207	178	230
Mar.	205	182	197	Sept.	205	174	244
Apr.	200	177	203	Oct.	205	192	251
May	201	178	213	Nov.	203	187	253
June	205	178	221	Dec.	200	193	253

Source: U. S. Department of Commerce.

Sales by the Rubber Industry

(In Millions of Dollars)

	1948	1949	1950		1948	1949	1950
Jan.	271	260	265	July	331	271	454
Feb.	265	251	273	Aug.	331	288	457
Mar.	270	260	293	Sept.	317	272	404
Apr.	285	257	288	Oct.	294	255	405
May	273	248	321	Nov.	291	247	419
June	299	266	350	Dec.	280	245	...

Source: U. S. Department of Commerce.

Rubber Manufacturers' Inventories

(Based upon Book-Value)

(In Millions of Dollars)

	1948	1949	1950		1948	1949	1950
Jan.	608	661	524	July	648	625	501
Feb.	625	661	526	Aug.	641	563	483
Mar.	634	653	532	Sept.	661	538	502
Apr.	625	648	536	Oct.	650	517	524
May	632	650	540	Nov.	667	526	561
June	645	644	544	Dec.	650	531	...

Source: U. S. Department of Commerce.

Various Compounding Materials Consumed by the Rubber Industry

Material	1943	1944	1945	1946	1947	1948	1949
Antimony, Primary:							
Short tons	....	...	...	...	39	41	55
% of total	....	....	.....	....	.002	.003	.005
Asphalt [a]							
Short tons	16,510	20,189	19,483	28,715	32,113	19,967	18,050
% of total	.005	.006	.005	.007	.007	.004	.003
Barite (Barytes):							
Short tons	8,000	10,000	10,000	20,000	17,000	18,000	14,000
% of total	3.9	2.9	2.1	4.4	3.1	2.85	2.53
Carbon Black:							
Short tons	236,737	369,015	402,193	470,732	471,790	435,282	383,565
% of total	90.3	94.6	95.5	95.3	94.3	95.5	93.3
Clay, Kaolin:							
Short tons	50,964	59,588	109,936	162,393	166,201	176,965	197,341
% of total	5.5	6.8	11.7	12.3	11.5	11.3	13.1
Clay, Fire & Stoneware:							
Short tons	10,259	7,160	7,800	12,951	17,970	15,480	.....
% of total	0.2	0.1	0.1	0.2	0.2	0.2	...
Lime:							
Short tons	2,039	5,634	7,170	3,193	589	1,154	.....
% of total	0.03	0.09	0.12	0.05	0.01	0.02	...
Litharge:							
Short tons	4,302	3,023	1,864	2,131	2,205	2,835	....
% of total	3.8	2.2	1.3	1.6	1.3	1.8	...
Lithopone:							
Short tons	1,078	726	977	1,607	3,085	4,192	3,245
% of total	0.8	0.5	0.7	1.1	1.9	3.0	4.1
Mica, Ground:							
Short tons	3,063	1,137	3,715	4,951	3,900	12,275	....
% of total	6.0	2.2	7.1	8.0	6.0	19.0	...
Sulfur:							
Short tons	51,000	63,000	64,960	72,800	72,800	70,560	59,360
% of total	1.8	1.9	2.0	2.2	1.8	1.7	1.5
Talc [b]							
Short tons	48,994	51,833	63,758*	65,980	71,840	66,226	53,414
% of total	11.8	13.0	16.0	14.4	13.9	13.0	.12
Zinc Oxide:							
Short tons	67,898	59,518	63,447	83,776	82,248	82,895	.....
% of total	47.4	42.3	49.6	53.1	51.2	54.9	.....

Source: U. S. Bureau of Mines.

Notes: [a] Solid and semi-solid products of less than 200 penetration. [b] Includes prophyllite and ground soapstone. * Revised.

RMP ANTIMONY

• ATTRACTIVE
• NON-DETERIORATING

for RED RUBBER

RARE METAL PRODUCTS CO.
ATGLEN, PA.

FINELY PULVERIZED, BRILLIANT
COLORS
FOR RUBBER-VINYLS

Western Representative: FRED L. BROOKE CO., 3340 N. Halsted St., Chicago 13, Ill.
Ohio Representative: PALMER SUPPLIES CO., 8905 Lake Ave., Cleveland; 800 Broadway, Cincinnati
Pacific Coast: ERWIN GERHARD, 625 Market St., San Francisco 5, Calif.

BROOKLYN COLOR WORKS INC.,
MORGAN & NORMAN AVES., BROOKLYN 22, N.Y.

SOFTENERS and PLASTICIZERS
For RUBBER
From the Pine Tree

ROSIN OIL
PINE TAR
BURGUNDY PITCH
GALEX a non-oxidizing RESIN
Send for "Pine Tree Products" *Booklet*

NATIONAL ROSIN OIL PRODUCTS, Inc.
R.K.O. BUILDING, RADIO CITY, NEW YORK 20, N.Y.
Plant: Savannah, Ga. Branches in Principal Cities
PIONEERS OF THE INDUSTRY

GUARANTEED
REBUILT MACHINERY
MILLS, CALENDERS,
TUBERS, VULCANIZERS,
PUMPS, ACCUMULATORS,
MIXERS, PULVERIZERS,
HYDRAULIC PRESSES,
CUTTING MACHINES
Immediate Deliveries from Stock

UNITED RUBBER MACHINERY EXCHANGE
183-189 ORATION STREET
NEWARK 4, N. J.
CABLE: "URME"

KAUTSCHUK UND GUMMI
the most quoted and authoritative
GERMAN RUBBER JOURNAL

KAUTSCHUK UND GUMMI promotes international exchange of ideas concerning economic, technical and scientific problems involved in the different phases of the manufacture of rubber and asbestos products.

KAUTSCHUK UND GUMMI is an excellent advertising medium which speaks to just those firms in the import and export trade to whom you want to speak. Sample copies and information about advertising rates may be obtained from the publishers.

KAUTSCHUK UND GUMMI
Berlin - Borsigwalde • Frankfurt am Main

STEEL CALENDER STOCK SHELLS

ALL STEEL, ALL WELDED CONSTRUCTION, with forged steel hubs for 1¼", 1½" and 2" square bars.

4", 5", 6", 8", 10", 12", 15", 20" and 24" diameters. Any length.

Also Special Trucks (Leaf Type) Racks, Tables and Jigs.

Used in manufacturing rubber and plastic products.

THE W. F. GAMMETER COMPANY
CADIZ, OHIO

GRANULATED CORK

Southland Cork Company | *P. O. Box 868 Norfolk 1, Va.*

NATIONAL SHERARDIZING & MACHINE CO.

AIR BAG BUFFING MACHINERY
STOCK SHELLS HOSE POLES
MANDRELS

858 Windsor St., Hartford, Conn.
Representatives: Akron New York

J. W. Jenkins Co., Inc.
2158 Front St., Cuyahoga Falls, Ohio (Akron) Phone: Swandale 4846
RUBBER MASTERBATCH — CRUDE RUBBER — PLASTICS — CHEMICALS

CLASSIFIED WANT ADS

RATES:

All Classifications (except Positions Wanted):
10c per word in light face type—Minimum, $3.00
15c per word in bold face type—Minimum, $3.00

Positions Wanted:
$1.00 for 30 words or less; extra words, 5c each.

When Box Number is used, add 5 words to word count.

Heading on separate line, $1.00 in light face; $1.20 in bold face.

Advertisements in borders: $15.00 per column inch; maximum, 85 words per inch.

All Classified Advertising must be paid in advance except for advertisers on contract. Send check with copy.

Replies to keyed advertisements will be forwarded to advertiser without charge.

Address all replies to Box Numbers care of RUBBER AGE, 250 West 57th Street, New York 19, N. Y.

Copy for April, 1951, issue, must be received by Monday, April 2nd.

POSITIONS WANTED

RUBBER CHEMIST: Widely experienced in the compounding and construction of rubber products seeks position in production or in technical service for rubber chemicals. Location immaterial. Address Box 894-P, RUBBER AGE.

FACTORY or GENERAL MANAGER: Chemical Engineer with twenty-four years compounding, technical production, general management and sales in all types of extruded and mechanical goods. Have had experience in large and small factories. Advise salary and duties. Interested in permanent position only. Address Box 897-P, RUBBER AGE.

MOLDED HOSE FOREMAN: Fifteen years experience in rayon and cotton yarns, technical and production all types of braided hose. Energetic. Location immaterial. Address Box 918-P, RUBBER AGE.

RUBBER CHEMIST, COMPOUNDER, DEVELOPMENT ENGINEER: Twenty-two years experience with large and small factories on a wide variety of products. Address Box 921-P, RUBBER AGE.

LATEX-PLASTIC EMULSION CHEMIST: M. S. Eighteen years general compounding and application. Broad experience in development, process control supervision and technical service. Desires responsible position laboratory or plant with established progressive company. Particularly interested in foamed latex, and plastic emulsions. Family, available immediately. Prefer East. Address Box 923-P, RUBBER AGE.

SUPERINTENDENT and PRACTICAL COMPOUNDER: Molding, mixing, calender and extruder experience. Forty-two years old. Prefer small shop. Address Box 928-P, RUBBER AGE.

PRODUCTION MAN, formerly head of the Molding Department of Pirelli in Belgium, now in this country, seeks opportunity with progressive manufacturer. Extensive experience with drug sundries, plumbers' specialties, light and heavy mechanicals, both natural and synthetic. Also extruding operations. Capable complete supervision of all compounding and processing operations. Salary requirement reasonable. Address Box 933-P, RUBBER AGE.

RUBBER and PLASTICS CHEMIST: B.S., fifteen years experience development, production, management in tires, cables, mechanicals, adhesives, etc. Desires change. Stimulating and responsible position. East preferred. Married, age 36. Address Box 934-P, RUBBER AGE.

CHIEF CHEMIST and TECHNICAL DIRECTOR: Graduate, with fifteen years experience in rubber and plastic industries on wire and cables, mechanicals, and technical sales, desires new position in responsible capacity with research organization or manufacturing company, or technical sales position with company merchandising raw materials. Address Box 935-P, RUBBER AGE.

Am desirous of connecting with one of the smaller companies in the East. Have had more than thirty years experience in the development and manufacture of mechanical rubber goods. Actual experience in compounding, manufacture, supervisory and managerial work. Permanency, where the benefits of practical experience will be appreciated. Address Box 938-P, RUBBER AGE.

HELP WANTED

ENGINEER—PROCESS DEVELOPMENT

GRADUATE ENGINEER PREFERABLY WITH EXPERIENCE OR WORKING KNOWLEDGE OF COMPOUNDING AND RUBBER EXTRUSION FOR WORK IN PROCESS DEVELOPMENT DEALING WITH THE PRODUCTION OF INSULATED WIRE AND CABLE. THE POSITION WILL INCLUDE THE DEVELOPMENT OF NEW PROCESSES AND THE IMPROVEMENT OF EXISTING PROCESSES INVOLVING ALL TYPES OF PRODUCTION PROBLEMS. WRITE STATING AGE, EDUCATION, EXPERIENCE, SALARY DESIRED AND STATUS REGARDING THE ARMED FORCES. ADDRESS BOX 941-W, RUBBER AGE.

HELP WANTED (Continued)

CHEMISTS—CHEMICAL ENGINEERS

"Positions with the better firms"

CHIEF CHEMIST, Ph. D. or M.S. deg. Heavy exp. mech'l rubber; some knowledge leather helpful. This is a responsible position demanding leadership ability, initiative and poise.

Call, write or wire—GLADYS HUNTING
DRAKE PERSONNEL, INC.
7 W. Madison St., Chicago 2, Ill., FI 6-2100

RESEARCH RUBBER COMPOUNDER: Must have tire factory experience in both natural and synthetic rubber. Address Box 880-W, RUBBER AGE.

SPONGE RUBBER CHEMIST: Require man with experience and capability. Permanent position with sound, well-financed company. Salary commensurate with ability. Forward detailed resume of experience and qualifications. Address Box 905-W, RUBBER AGE.

RUBBER CHEMIST: Experienced in fuel cell compounding. State age, education, experience and salary requirements. All correspondence confidential. Address Box 922-W, RUBBER AGE.

CHIEF CHEMIST: For laboratory in Midwest location which conducts chemical and physical tests on rubber. Must be an alert, aggressive good manager. State full details on education, experience and salary requirements. Address Box 927-W, RUBBER AGE.

MECHANICAL ENGINEER: Excellent opening for technically trained mechanical engineer with knowledge of or interest in rubber and plastic processing equipment and related activities for development work with major manufacturer. Salary to be commensurate with proven ability and experience. Location—Chicago. Address Box 929-W, RUBBER AGE.

PRODUCTION COATING SUPERVISOR: An excellent opportunity for a technically trained man with major experience in rubber and plastic coatings on fabric or paper plus knowledge of solution mixing, storage and handling of plastic and rubber solutions and spreaders and ovens to assume supervisory responsibility in an enlarging production section of a major manufacturer. Production primarily concerned with adhesives. Salary and responsibility to be commensurate with ability. Location—Chicago. Address Box 930-W, RUBBER AGE.

CHEMIST: Thoroughly experienced rubber compounding and processing rubber extrusions, molded products, etc. Good salary, steady position. Address Box 931-W, RUBBER AGE.

A CAPABLE LEADER: Thoroughly experienced in rubber extrusions and molded items. Good salary, excellent opportunity for advancement. Address Box 932-W, RUBBER AGE.

FLUORINE CHEMIST

If you are looking for a real position with a major rubber and plastic manufacturer, we have something to offer. Ph.D. organic chemist with special training in field of fluorine chemistry.

Address Box 939-W, RUBBER AGE.

✓ CHECK WITH US FOR **Rubber and Plastic** 40 YEARS EXPERIENCE

√ UNCURED COMPOUNDS √ RUBBER **Scrap** √ POLYETHYLENE √ VINYL (PVC)

ROTEX RUBBER COMPANY INC.

1-23 JABEZ ST., NEWARK 5, N. J. TELEPHONE: HUMBOLDT 2-8000

BUSINESS OPPORTUNITIES

BLACK

Master Batching
Mixing of all kinds

BESTREAD PRODUCTS CO. STOUGHTON, MASS.

SELL NOW! MARKETS ACTIVE! Wanted: Pigments, Chemicals, Colors, Resins, Solvents, Oils, Waxes, Lacquers. Other Materials, Supplies, Equipment, etc. CHEMICAL SERVICE CORP., 84-04 Beaver St., New York 5, N. Y.

RUBBER TECHNICIAN: Wants to contact small rubber manufacturer who would be interested in producing specialized rubber parts with large profit margin. Would only be interested in partnership or percentage basis. Address Box 910-B, RUBBER AGE.

NEW PRODUCTS WANTED: We are prepared to manufacture, finance, and distribute any sound rubber item with sales potential in the automotive and plumbing fields. Give details in first letter. Rubber Division, RADIATOR SPECIALTY COMPANY, Charlotte 1, N. C.

WHAT CHEMICALS DO YOU NEED?

We are chemical dealers and can locate for you chemicals which are in short supply. Let us know your needs and we will advise you promptly whether or not we can locate same. We can save you time, effort and money. Contact us immediately.

PYRAMID CHEMICAL COMPANY

Liberty Trust Bldg., Broad and Arch Streets, Philadelphia 7, Pa.
Rittenhouse 6-6592

Boston MANUFACTURER'S AGENT with engineering background, now handling process equipment to rubber and plastics industries in New England, desires additional equipment or material account. Address Box 920-B, RUBBER AGE.

CUSTOM MIXING

We do milling and compounding of all types —blacks or colors—Master Batches. All mixing done under careful supervision and laboratory control.

Phone: Butler 9-0400

Pequanoc Rubber Company Butler, N. J.

GRANULATED CORK

PROCESSED TO SPECIFICATION

MARYLAND CORK COMPANY, INC.
1528 Munsey Bldg. Baltimore 2, Md.

Engineered Application of Heat in Continuous Materials Handling Systems

INDUSTRIAL OVENS, INC.

13825 TRISKETT ROAD, CLEVELAND 11, OHIO

BUSINESS OPPORTUNITIES (Continued)

FOR SALE—RUBBER PLANT

Modern equipped for molded-extruded rubber products for industrial trade; three hydraulic electrically heated presses; 4½" extruder; miscellaneous equipment; molds; 4,500 square feet; rent $125; located Parkersburgh, West Virginia; inactive owners; price $15,000. APPLE COMPANY, Brokers, 1836 Euclid Ave., Cleveland, Ohio.

FOR SALE: Large manufacturing plant, 7 mills, Banbury Mixer, large sponge presses, 25 presses—36" x 36", 3 vulcanizers, tubing machines, calender machines, rubber cement churns, located in Ohio, no unions, must have $750,000.00 in cash. Address Box 926-B, RUBBER AGE.

Government and private industry demand that molds and products be X-Rayed for flaws. X-Ray equipment can now be obtained according to your specifications on short notice. If interested, Address Box 936-B, RUBBER AGE.

EQUIPMENT WANTED

WANTED: Complete rubber plants. Also individual items such as: 2-roll mills, calenders, mixers and Banbury Mixers. R. GELB & SONS, INC., State Highway No. 29, Union, New Jersey.

EQUIPMENT FOR SALE

SAVE WITH GUARANTEED REBUILT EQUIPMENT—Hydraulic Presses: 24" x 24", 18" ram, 318 tons; 24" x 56", 450 tons, multiple opening; 24" x 24", 16" ram, 250 tons; 24" x 24", 12" ram, 170 tons; 24" x 42", 2—1.7" rams, 340 tons; 42" x 42", 15" ram, 250 tons; 36" x 36", 12" ram, 141 tons; 20" x 18", 10" ram, 118 tons; 20" x 20", 10" ram, 118 tons; 19" x 24", 10" ram, 78 tons; 22" x 15", 8" ram, 75 tons; 27" x 21", 8" ram, 75 tons; 15" x 15", 8" ram, 75 tons; 12" x 12", 7½" ram, 60 tons; 12" x 12", 6½" ram, 50 tons; 8" x 9½", 4½" ram, 20 tons; 16" x 16", 3½" ram, 12 tons. Laboratory Presses: 10 ton Carver, 6" x 6"; 30 ton Watson-Stillman, 6" x 6". Laboratory Mills and Calenders: (New) M.D.; Thropp Mill, 16" x 40" M.D. New Dual Pumping Units, all sizes. Extruders: Royle Rubber #2; Royle Plastic #1. Preform Presses: Stokes T; Colton 5½T; Stokes DDS4 with Reeves Drives. Also Mixers, Vulcanizers, Accumulators, etc. UNIVERSAL HYDRAULIC MACHINERY COMPANY, 285 Hudson Street, New York 13, N. Y.

(Continued on next page)

BUYING SELLING

USED MACHINERY FOR THE RUBBER

AND ALLIED INDUSTRIES

MILLS, CALENDERS, HYDRAULIC PRESSES, TUBERS, VULCANIZERS, MIXERS, ETC.

ERIC BONWITT 431 S. DEARBORN STREET CHICAGO 5, ILLINOIS

SINCE 1880 RUBBER & PLASTIC

"They Last Longer" REG. U. S. PAT. OFF.

Rand REG. U. S. PAT. OFF.

DRESS SHIELDS — DRESS SHIELD LININGS — BABY PANTS — BABY BIBS & APRONS — SANITARY WEAR — RUBBERIZED SHEETING

RUBBER APRONS — STOCKINET SHEETS — RUBBER SHEETS — RAINCAPES & COATS — RUBBER SPECIALTIES — DOLL PANTS, CAPES, ETC.

RUBBER DAM & BANDAGES — SHEET GUM

RAND RUBBER CO. BROOKLYN, N. Y. U. S. A. MFRS.

HOWE MACHINERY CO., INC.

30 Gregory Avenue, Passaic, N. J.

DESIGNERS & BUILDERS OF V BELT MANUFACTURING EQUIPMENT

Cord Latexing, expanding mandrels, automatic cutting skiving, flipping and roll drive wrapping machines

ENGINEERING FACILITIES FOR SPECIAL EQUIPMENT

Call or Write

FLEXO JOINTS

THE STANDARD FOR SAFETY

- Proved in years of efficient service, FLEXO JOINTS offer the flexibility of hose — the strength of pipe — the ideal steam connection for presses, tire molds, etc.

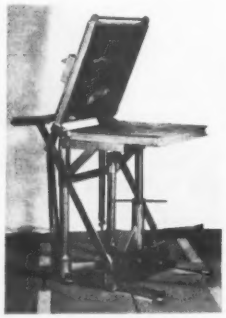
Four styles, for standard pipe sizes ¼" to 3".

- Write for information and prices.

FLEXO SUPPLY CO., INC., 4662 Page Blvd., St. Louis 13, Mo. In Canada: S. A. ARMSTRONG, LTD. 1400 O'Connor Dr., Toronto 13, Ont.

SPONGE RUBBER VULCANIZING PRESS

HIGHEST EFFICIENCY LOW COST



Rapid operation; easily closed and opened.

Guaranteed sufficient pressure for all sponge rubber requirements.

Standard Platen Size 26" x 26". Floor space required, 30" x 30" — No floor space lost by work table. All other special sizes of platens available to fit any requirement.

MANUFACTURED BY STANLEY H. HOLMES CO., CHICAGO, ILL.

SOLE AGENT

ERIC BONWITT

431 So. Dearborn St. CHICAGO 5, ILL.

Phone: WEbster 9-3548

For Your RUBBER MACHINERY

Buys of the month . . . . .

MILLS

18" x 48"
16" x 45"
16" x 40"
16" x 30"
8" x 24"

PRESSES

2—24x24—18" rams (used)
2—32x32—18" rams (used)

CALENDERS

28" x 78"
24" x 66"
18" x 48"
10" x 24"

VULCANIZERS

2-84" dia. x 15' long, with quick opening doors, 100 lb. p.s.i. complete.

Also new all-steel Vulcanizers—any dia. and length.

BANBURY MIXERS

#3, #9

EXTRUDERS

1", 2½", 3¼", 4½", 6"

In addition to the above we have available any and all machinery necessary for the processing of rubber

AKRON RUBBER MACHINERY CO.

P.O. Box 88 Phone WAlbridge 1183-4 Akron, O.

EQUIPMENT FOR SALE (Continued)

FOR SALE: Banbury Mixers, Mills, Calenders, Laboratory Mill and Banbury Unit, Extruders, Tubers, Hydraulic Presses. Send for detailed bulletin. EAGLE INDUSTRIES, INC., 110 Washington Street, New York 6, N. Y. DIgby 4-8364-5-6.

FOR SALE: Three Robinson Unique Frigidise grinders with 50 hp 220/440 volt integral motors made by Mercer-Robinson Co., New York City—two new, one only slightly used; one Robinson gyro sifter—slightly used; two Thropp 8-opening presses—36" x 36" steam heated platens—18" rams for 2000 lb. W.P.; one Thropp 4-opening press—36" x 36" steam heated platens—new 18" chrome plated ram for 2000 lb. W.P.; one #3A Coulter special volumetric blanking machine for heel and sole biscuits—new; one Biggs Boiler Works open steam vertical vulcanizer, 36" dia. x 48" deep, with hinged counter balanced cover—new; one Pancorbo chopper, less motor, used; one Pancorbo span grinder, used; two Lawson 38" square paper or stock cutters, used; one Chandler Price 39" square paper or stock cutter, used, with motor. Address Box 917-S, RUBBER AGE.

FOR SALE: 24 x 48 Farrel calender, extra heavy duty, 3-roll, new 1948, used very little; with Farrel herringbone reduction gear unit, automatic oiler, herringbone connecting and ball gear. Even and friction speeds, bed plate. No motor or controls. Push button adjustments. Address Box 919-S, RUBBER AGE.

FOR SALE: Three-roll 6" x 16" calender, complete with motor and drive. Address Box 924-S, RUBBER AGE.

FOR SALE: Two jacketed vulcanizers with quick opening doors, each 18 ft. long x 5 ft. diameter, complete with loading cars. Immediate delivery. Address Box 925-S, RUBBER AGE.

FOR SALE: BANBURY BODIES AND PARTS. Surplus inventory. Banbury bodies #11 spray, #9 spray, #9 jacketed, and #3A spray, complete with door. Spare parts for most sizes, including rotors, end frames, rotor collars, side jackets, door tops, gland rings, hoppers, connecting gears, and many others. Write or wire INTERSTATE WELDING SERVICE, Offices, Metropolitan Bldg., Akron 8, Ohio.

FOR SALE: One 6' x 18' high pressure Vulcanizer, quick opening door; RUBBER MILLS—6" x 12", 10" x 24", 16" x 30", each with motor and drive; one 32" x 45" Hydraulic Press, 24" ram. Also Tubers, Vulcanizers, Hydraulic Presses, Calenders, etc. Send us your inquiries. CONSOLIDATED PRODUCTS CO., INC., 14-19 Park Row, New York 7, N. Y. Phone: BArclay 7-0600.

FOR SALE: Print Machines, Drying Cylinders, Tubing Measuring and Examining Machines, Beamers, Calenders, etc. Excellent condition. We welcome your inquiries. INDUSTRIAL PRODUCTS OF AMERICA, 140 Market Street, Paterson, New Jersey.

for MAXIMUM returns at minimum cost,

advertise in the Classified columns of

RUBBER AGE

Directory of CONSULTANTS

R. R. OLIN LABORATORIES

Rubber Technologist—Development and research in Natural Rubber, Synthetic Rubber and Plastics. Also chemicals and compounding materials used with these materials.

PO Box 372 RA, Akron 9, Ohio

SOUTH FLORIDA TEST SERVICE
(Established 1931)

Corrosion, weathering and sunlight tests. Four locations in Southern Florida for inland, salt atmospheric, tidewater and total immersion exposure tests.

4201 N. W. 7th St., Miami, Florida

NEW and REBUILT MACHINERY

SINCE 1891

L. ALBERT & SON

Trenton, N. J. Akron, O. Chicago, Ill. Los Angeles, Calif.

INDEX TO ADVERTISERS

A

A-C Supply Co. — Adamson United Co. Insert Following 670 — Advance Solvents & Chemical Corp. 672 — Akron Equipment Co. — Akron Rubber Machinery Co. 762 — Akron Standard Mold Co. — Albert L., & Son 762 — Alco Oil & Chemical Corp. 755 — All Steel Welded Truck Co. — American Cyanamid Co. Calco Chemical Div. Insert Following 680 — Industrial Chemicals Division — American Machine & Foundry Co. — American Polymer Corp. — American Resinous Chemicals Corp. — American Zinc Sales Co. 655 — Armstrong Machine Works 739 — Atlas Electric Devices Co. 738 — Atlas Valve Co. 745

B

Bagley & Sewall Co. — Baird Rubber and Trading Co. — Baker & Adamson Products, General Chemical Div., Allied Chemical & Dye Corp. — Baker, J. T., Chemical Co. 659 — Ball and Jewell, Inc. 743 — Barrett Div., Allied Chemical & Dye Corp. — Beacon Co. — Bastread Products Co. 761 — Binney & Smith Co. Insert Following 721 — Black Rock Mfg. Co. — Bolling, Stewart, & Company, Inc. — Borwitt, Eric 761, 762 — Bridgwater Machine Co., Athens Machine Div. — Brockton Cutting Die & Machine Co. — Brooklyn Color Works, Inc. 759 — Brown Company —

C

Cabot, Godfrey L., Inc. 663 — Cambridge Instrument Co. — Cameron Machine Co. — Carey, Philip, Mfg. Co. — Carter Bell Mfg. Co. 744 — Chemical & Pigment Div., Glidden Co. — CLASSIFIED ADVERTISING 760, 761, 762 — Cleveland Liner & Mfg. Co. 640 — Colledge, E. W., General Sales Agent, Inc. 748 — Columbian Carbon Co. Insert Following 721 — Concord Mica Corp. 763 — CONSULTANTS SECTION 762 — Continental Carbon Co. 645 — Cooke Color & Chemical Co. 656 — Coulter, James, Machinery Co. 741

D

Diamond Alkali Company Pure Calcium Prod. Div. 644 — Dow Corning Corp. 658 — du Pont de Nemours, E. I., & Co., Inc. Organic Chemicals Department — Rubber Chemicals Div. Second Cover

E

Emerson Apparatus Co. — English Mica Co. — Erie Engine & Mfg. Co. 664

F

Farrel-Birmingham Co., Inc. 676, 677 — Fawick Airflex Co., Inc. — Federal Products Corp. — Ferry Machine Co. 745 — Flexo Supply Co., Inc. 761 — Foremost Machine Builders, Inc. — Foxboro Company —

G

Gammeter, W. F., Co. 759 — General Atlas Carbon Co. 651 — General Chemical Division, Allied Chemical & Dye Corp. — General Electric Co. Apparatus Dept. 647 — Chemical Dept. — General Latex & Chemical Corp. 748 — General Magnesite & Magnesia Co. — Genseke Brothers 661 — Gidley, Philip Tucker — Glidden Co., Chemical & Pigment Div. — Goodrich, B. F., Chemical Co. (Chemical) — Goodrich, B. F., Chemical Co. (Hycar) 637 — Goodyear Tire & Rubber Co. (Chemical Div.) 639, 643 — Gummi und Asbest 757

H

Haas Miller Corp. 755 — Hadley Bros.—Uhl Co. 675 — Hall, C. P., Co. 660 — Hardesty Chemical Co., Inc. 648 — Hardman, H. V., Co., Inc. 757 — Harwick Standard Chemical Co. Back Cover — Heveatex Corporation 753 — Hoggson & Pettis Mfg. Co. — — Holliston Mills, Inc. 749 — Hotel Empire 728 — Howe Machinery Co., Inc. 761 — Huber, J. M., Corp. 684

I

Indoil Chemical Co. 669 — Industrial Ovens, Inc. 761 — Institution of the Rubber Industry 746 — Interstate Welding Service —

J

J. W. Jenkins Co., Inc. 759 — Johnson Steel & Wire Co., Inc. 672

K

Kautshuk und Gummi 759

L

Littlejohn & Co., Inc. —

M

Magnolia Metal Co. — — Marbon Corp. — — Marine Magnesium Products Corp. — — Maryland Cork Co. 761 — McNeil Machine & Engineering Co. — — Monsanto Chemical Co. 665 — Mt. Vernon-Woodberry Mills, Inc. 649 — Muehlstein, H., & Co., Inc. 737

N

National-Erie Corp. 739 — National Lead Co. — — National Rosin Oil Products, Inc. 759 — National Rubber Machinery Co. 680 — National Sherardizing & Machine Co. 759 — National-Standard Co. — — Naugatuck Chemical, U. S. Rubber Co. 641, 686 — Neville Co. 667 — New Jersey Zinc Co. 650

O

Olin, R. R., Laboratories 762 — Osborn Mfg. Co. 678

P

Pan American Chemicals Div., Pan American Refining Corp. 749 — Pennsylvania Industrial Chemical Corp. — — Pequanoc Rubber Co. 761 — Phillips Chemical Co. 638 — Pike, S. J. & Co., Inc. 753 — Pittsburgh Plate Glass Co., Columbia Chemical Div. — — Polymer Corp. 670 — Pyrometer Instrument Co. —

R

Rand Rubber Co. 761 — Randall, Frank E., Co. 747 — Rare Metal Products Co. 759 — Revue Generale Du Caoutchouc — — Richardson, Sid, Carbon Co. 764 — Rotex Rubber Company, Inc. 760 — Royle, John, & Sons 743 — Rubber Corp. of America, Latex Div. 751

S

St. Joseph Lead Co. 652 — Schulman, A., Inc. Inside Back Cover — Scott Testers, Inc. 742 — Sharples Chemicals Inc. — — Shaw, Francis, & Co., Ltd. 668 — Shell Oil Co. — — Simplex Cloth Cutting Machine Co., Inc. — — Sindar Corporation — — Sivon Machine Co. 743 — Skelly Oil Co., Solvents Div. — — South Asia Corp. 757 — South Florida Test Service 762 — Southeastern Clay Co. — — Southern Clays, Inc. 674 — Southland Cork Co. 759 — Spadone Machine Co. — — Spencer Products Co. 757 — Stamford Rubber Supply Co. 751 — Standard Machinery Co. 745 — Stanley Chemical Co — — Stanley Electric Tool Div. — — Stauffer Chemical Co. — — Stein, Hall & Co., Inc. 666 — Stoner's Ink Co. 763 — Sun Oil Co. 679 — Synvar Corporation —

T

Taber Instrument Corp. 739 — Testworth Laboratories, Inc. 751 — Thropp, Wm. R., & Sons — — Titanium Pigment Corp. 642 — Trade News Service — — Tumpeer Chemical Co. 757 — Turner Halsey Co. 649

U

United Carbon Co. Inserting Following 654 — United Engineering & Foundry Co. 673 — United Rubber Machinery Exchange 759 — U. S. Rubber Reclaiming Co. 646 — Utility Mfg. Co. 747

V

Vanderbilt, R. T., Co. Front Cover

W

J. J. White Products Co. 675 — Whittaker, Clark & Daniels, Inc. — — Williams, C. K., & Co. 740 — Wills Rubber Trimming Machine Co. 745 — Wilson, Charles T., Co., Inc. 755 — Witco Chemical Co. 645 — Wood, R. D., Co. 657 — Wyandotte Chemicals Corp. 662

If you are having trouble with the adhesion of cements . . . if your rubber products come out too slippery, try a sample of our

MOLD LUBRICANT #735—pH 10.

or

MOLD LUBRICANT #769—pH 7.9

These two Mold Lubricants have proven themselves the best in the field and they give you a drier surface than other rubber lubricants of equal efficiency.

Mold Lubricants #735 and #769 are not emulsions. You get perfect mixture with hard or soft water or alcohol, and there is no separation on standing. This insures perfect lubrication on all types of molds.

Try a sample of our Mold Lubricants #735 and #769 and cure your troubles

STONER'S INK COMPANY

QUARRYVILLE, PENNA.

MICA **WATER-GROUND** "At Its Best"

Every rubber manufacturer using Water-Ground Mica should be using "CONCORD" because:

1—It is ground exclusively from a clean, white Muscovite Mica scrap imported from India and Africa.

2—It is whiter and purer.

3—It is strictly competitive in price.

Send for samples and prices

CONCORD MICA CORPORATION

27 Crescent Street Penacook, N. H.

...at close range

The closer the Indian got to his target, the surer he was that the arrow would strike accurately and with sufficient force.

You are closer to your "target" of quality production at the most economical cost when you depend upon ***TEXAS "E"*** and ***TEXAS "M"***, highest quality channel blacks.

With the world's largest channel black plant and available nearby natural resources, the Sid Richardson Carbon Co.,can assure you a continuous supply of these constantly uniform and economical-to-use blacks.

TEXAS
CHANNEL BLACKS

Sid Richardson
CARBON CO.
FORT WORTH, TEXAS

GENERAL SALES OFFICES
EVANS SAVINGS AND LOAN BUILDING
AKRON 8, OHIO

keep calling A. Schulman Inc.

AKRON, OHIO
790 E. Tallmadge

AKRON
HEmlock
4124

NEW YORK CITY
500 Fifth Ave.

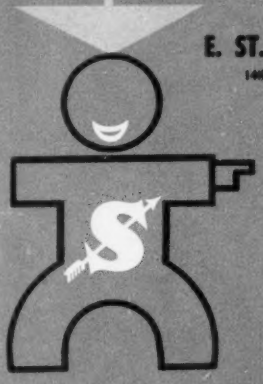
NEW YORK
LOngacre
4-5960

BOSTON, MASS.
730 Statler Bldg.

BOSTON
LIberty
2-2717

E. ST. LOUIS, ILL.
14th and Converse

EAST
ST. LOUIS
BRidge
5326



A. Schulman Inc.
Rubber and Plastics

IF YOU ARE IN THE *Pacific Coast* AREA . . .

All the way across the country to Los Angeles there are branch offices of the Harwick Standard Chemical Company . . . Each office is strategically placed to serve an area of industrial concentration. Each is staffed by technical sales representatives who are qualified by both training and experience to help you find the answer to many of today's production or compounding problems . . . There is a problem of scarcity, for instance, which Harwick Standard Chemical Company technical representatives have helped many manufacturers to meet with effective substitutions without loss of product quality or reduction of performance standards . . . Why not ask them to help you!

PRODUCTS:

SYNTHETIC RESINS: Para Coumarone Indenes, Hydro Carbon Terpenes, Piccolastics (Styrenes) . . . **COLORS:** Plastic dispersed, Dry Powder, Rubber Inks . . . **SOFTENERS:** Resinous, Liquids . . . **FILLERS:** Silene EF, Clays, Whitings . . . Etc.

OUR BRANCH IN LOS ANGELES . . .

is conveniently located at 1248 Wholesale Street—Telephone: Tucker 2023—under the management of D. C. Maddy. Warehouse facilities are maintained in connection with the branch and quick service of supply can be provided on most Harwick Standard Chemical Company materials.

D. C. MADDY,
Manager

of the Los Angeles Branch, was trained as a chemical engineer, and has had extensive experience in rubber compound development and production. His technical knowledge places him in position to be helpful on many compounding, development and production problems.

Let us demonstrate this service from Akron, Boston, Chicago, Denver, Los Angeles or Trenton.

HARWICK STANDARD CHEMICAL CO.

AKRON, OHIO